A STUDY OF THE DISTRIBUTION OF THE TREE AND SHRUB VEGETATION IN THE CENTRAL ZONE OF DARFUR, SUDAN.

By

D. McC. RAMSAY, B.Sc.(For.)

Forests Department,

A. E. Sudan.

C O N T E N T S.

(iv)/

APPENDICES.

INDEX of MAPS and DIAGRAMS.

PREFACE

The field-work on which this thesis is based was carried out in Darfur Province, Anglo-Egyptian Sudan, between 1951 and 1953. It was carried out under the supervision of Professor Stebbing from January to June 1951, and subsequently under Professor Anderson, successive holders of the Chair of Forestry in the University of Edinburgh. The writer is deeply indebted to both Professor Stebbing and Professor Anderson for the experience he gained under their supervision.

To Dr. Fairbairn, also of the Department of Forestry in the University, is due another debt of thanks for many interesting and stimulating discussions on the subject of tropical vegetation and its classification.

To Mr. W. L. Marjoribanks, Chief Conservator of Forests, Sudan Government, is due grateful thanks for permission to carry out the field-work in the Sudan.

The writer is also indebted to Mr. J. K. Jackson, Sylviculturist, Sudan Government, for assistance in botanical identifications, and for helpful suggestions on methods of sampling.

Where use has been made of published work, this has been acknowledged in the text. The titles of Works cited in the text is given at the end of each chapter. Acknowledgment to official sources of information is also made at the end of the chapter to which it refers.

Finally, grateful acknowledgment is made to the writer's African staff, and in particular to Forest Guard Ahmed Sellim, for assistance in the laying-out of enumeration plots.

A word of explanation is necessary regarding the maps embodied in this thesis. These have been coloured in coloured pencil, as a paint or ink wash tends to cause distortion of the photo-print paper on which they are reproduced.

BRIEF NOTE on BOTANICAL NOMENCLATURE.

In the Sudan, the tree known in Arabic as "seyal" is given in Brown & Massey's "Flora of the Sudan" (1929), as Acacia spirocarpa Hochst. Both Andrews and Smith refer to it as A. raddiana Savi. Mr. A. C. Hoyle of the Imperial Forestry Institute, Oxford, in a private correction to Brown & Massey's Flora, identifies this species as A. tortilis (Forsk.) Christensen. This is the name used for this species by the writer throughout this paper. Similarly, the tree known in Arabic as "samr", is given in Brown & Massey's Flora as Acacia tortilis Hayne. This is the name used by Andrews & Smith. Hoyle notes in his correction that this species "e descript. Hayne from Forsk." is A. raddiana Savi. To avoid confusion, wherever these species are used by Andrews or Smith and quoted in this present work, the writer has taken the liberty of changing the nomenclature to accord with Hoyle above, and to be in unison with the nomenclature used throughout this investigation.

The species here called Acacia adansonii Guill. and Perr. has been elsewhere called A. arabica Willd. In the Sudan this latter name has been used for both A. nilotica and A. adansonii, as the Arabic name "sunt" is common to both species. The characters used by the writer to differentiate these two species are:

(A) Fruits glabrous, very constricted between seeds ..... Acacia nilotica D.C.

(B) Fruits pubescent, hardly constricted between seeds ..... Acacia adansonii G. & P.

In addition, the site requirements of both species are different. A. nilotica prefers flooded sites on which water stands, while A. adansonii prefers riparian sites, but will not stand flooding.

When correlating the works on the vegetation of West Africa, the following point (Fairbairn, 1943) requires stressing./

stressing. Acacia seyal as used by Dundas is really A. raddiani Savi.

Also, the Acacia arabica of the West African workers, is probably (Aubreville certainly) the A. adansonii of the present writer.

PART ONE.

GENERAL DESCRIPTION of DARFUR and the MAJOR ENVIRONMENTAL FACTORS.

CHAPTER I.

SITUATION, TOPOGRAPHY and HYDROGRAPHY.

Situation.

Darfur is the most westerly province of the Anglo-Egyptian Sudan. It extends from approximately 10° to 16° 30' North and from 22° to 26° 30' East; has a total area of 138,150 square miles, and an estimated population of 876,000. In comparative terms, the province is between a third and a half the size of Nigeria, or to take an example closer to hand, it is four and a half times the size of Scotland.

It is bounded on the north by the Libyan desert (Northern province), on the east by Kordofan province, on the south by Bahr el Ghazal province and on the west by French Equatorial Africa. The first three are provinces of the Sudan.

The provincial capital is El Fasher, and for administrative purposes the province is divided into five districts as follows:

District	Headquarters	Area (sq. mls.)
Central & Eastern	El Fasher	18,290
Northern	Kutum	50,460
Southern	Nyala	46,385
Western	Zalingie	14,170
Dar Masalit	Geneina	8,845
		138,150

The central zone of Darfur as taken for the present investigation, is a belt roughly 150 miles deep from north to south, running across the full width of the province. In terms of latitude the northern boundary is 15° 30' N in the west, to 14° N in the east, and the southern boundary is 12° N. The area of this zone is 71,164 square miles, which is 51·5% of the total area of the province, or roughly two and a third times the size of Scotland.

Topography.

The greater part of the province is a plain ranging from 2,000' to 3,000' above sea level. A range of volcanic mountains, Jebel Marra, 45 miles long and 20 miles wide at its widest part, runs north and south along longitude 24° 30' E and between 12° 45' N and 13° 30' N.

From the north end of the Marra mountains, a range of hills runs northwards to west and north of Kutum. At their highest point these are called the Gurgei hills. Other centres of volcanicity lie in a line north east from the central massif, and are situated to the east and north of Mellit, giving rise to the Berti or Tagabo hills, and further north east in the same line, the Meidob hills. The highest of these ranges is the Marra massif with Jebel Ufugu, 10,130', the highest peak, and much of the central backbone above 6,000'. The subsidiary ranges seldom exceed 5,000'.

In addition to the above, there are numerous inselbergs scattered throughout the province. These may be either volcanic or sandstone hills. To the NNE of Kutum, there is a large sandstone plateau, the Teiga plateau, rising to between 500' and 1,000' above plain level.

From the main mountain skeleton, the ground falls away, in the north to the sand and gravel wastes of the Libyan desert, in the east to rolling sandy steppes, in the south to tree covered broken plains, and in the south west and west to a plateau which reaches to between 3,000' and 4,000'.

Hydrography.

There are four principal drainage channels in the province. They are, in the north the Wadi Howar, which rises in French Equatorial Africa and flows into Lake Undur. From there through Tini and to the 24th meridian of longitude it forms the international boundary between the Sudan and French/

French territory, and finally it disappears into the desert. From the north and north east aspects of the central mountains flow many khors and wadis which ultimately drain into the Wadi el Ku, to disappear eventually in a desert delta to the east of Nyala. The third main channel is the Wadi Azum, into which ultimately debouch all the streams from the western side of the Marra range. The Azum flows through Zalingie and enters French Equatorial Africa at Mogororo, where it is joined by the fourth main channel, the Wadi Kaja. This flows south through Dar Masalit from north of Geneina. The united Kaja and Azum flow westward through French territory and ultimately drain into Lake Chad.

These large wadis are all fed by smaller streams, the majority of which rise in the mountain backbone of the province. In the upper regions of the mountains many of these streams are perennial. During the dry season the flow is small, and in no case does the writer know of any wadi carrying a surface flow for more than 12 or 15 miles from its mountain source. During the rains, however, these mountain streams become raging torrents and are capable of moving boulders weighing half a ton from their positions. They are young streams, with a steep gradient and a rock bottom with gravel in between the boulders. The current is too swift for any sand to be deposited in the stream bed. In the foothills two or more of these wadis may join and flow out on to the plains. As they proceed, the gradient becomes flatter and the bottom more sandy.

One such typical Wadi is the Wadi Nyala. At 50 miles from its source this has a bed of soft sand and is up to 200 metres wide contained by shallow banks of sandy-silt. There is usually a main channel, maybe 50 metres wide, cut a metre or so deeper than the rest of the bed. This channel is not necessarily along the centre of the Wadi bed, in fact it usually winds from side to side in a serpentine fashion

across/

across the bed.

As already noted, these Wadis are not perennial, even during the rains they do not run continuously, but flush after each heavy storm in the catchment area. The rains may be said to start in mid June in the foothills catchment area, and it is roughly a month from then before the first flush reaches Nyala, 50 miles along the Wadi. This first flush is a curious phenomenon, the water does not come down as a solid wall or bore, but rather creeps along insidiously. The advancing water carries along in its van a broad carpet of dirty yellow-brown spume which advances slowly along the channel, followed by the muddy brown water of the first flood. One can stand in the bed of the channel and watch this belt of spume coming towards one, and seemingly damming up the waters behind it. The logical explanation is simple, the first flush of water is constantly being seeped up by the sand as it advances and having to be replaced from the main flow behind, before another foot can be won in the inexorable advance. This, too, of course, is the reason for the time lag between the first rains and the time the first flush reaches any point some distance downstream.

Subsequent flushes make the passage much more easily, since the sand of the bed is already largely saturated.

After a heavy, widespread rain storm the wadis might run for up to three days at a stretch and water lie in the bigger ones for another week or more. The average flow is of shorter duration, however - twelve to twenty-four hours being the usual run. The average flow after a storm starts as a trickle - almost 100% direct run-off from the plains coming via khors and minor wadis to the main wadi, then the main waters from the foothills arrive and the build-up to maximum flow is very rapid. Sometimes the main flow arrives in the form of a bore two feet or more high, but usually maximum is achieved after a steady, although comparatively rapid, build-up./

build-up. A high level of flow is maintained for some six to eight hours, and then the decline sets in, taking roughly twice as long to subside as the period of peak flow.

This particular Wadi, and the others flowing east never get anywhere. They just gradually meander to a standstill. As the gradient gets less, so the velocity of the water decreases and the finer particles held in suspension are allowed to settle. Ultimately the end-point or terminal delta is reached, a flat plain on which is deposited the last of the silt and clay particles and on which the water just stands until evaporated.

The Wadis draining the west and south-west aspects of the Marra massif, on which side lies the rain-shadow and hence is better watered, are in consequence generally larger and carry a bigger flow of water. The biggest of the western Wadis is the great Wadi Azum. In its middle reaches in the Sudan this is already a huge Wadi with a channel 400 metres and more wide, contained by banks up to 2 metres high. It is said to flow for a week or more at a time, and at any time during the rains some flow, however small, is passing down its channel. While not perennial, the Wadi Azum to the north of Mogororo is shown on the map as having a series of fairly large permanent pools along its course. These pools are said to contain fish and crocodiles all the year round.

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22 23 24 25 26

FRENCH EQUATORIAL AFRICA

W. HOWAR
Bareira Ws.
W. HOWAR
W. Baba
W. Tini (HOWAR)
W. Buei
W. Sharweia
W. MUGARIB
Teiga Plateau
W. Sherangal
W. Umm Jart
W. Shegg el Gieifer
Furawaiya Ws.
Karnoi Ws.
Tini Ws.
Umm Buru
LAKE UNDUR
Tendelwai
Kulbus
Silearia
W. Abu Adrei
W. Arada
W. Abu Suri
W. Gerreifar (KAJA)
Adre
Geneina
W. Kaja
W. Barei
Misterai
W. Borgu
Kebkabiya
Gurgei Hills
Kara Simbil
Tina
Tawila
Dor
Kutum
W. Kutum
Mellit
W. Beida
Wana Hills
W. Tabus
umm Marahig
Khureit
El Fasher
W. El Ku
W. Abu Zereiga
Tarnei
Turra
Dariya
Dobo
Genaing Hills
Gurgor
GULDU
Kebe
MARRA MASSIF
Nyertefei
Suni
Deriba
W. Sanie (Azum)
Mosku
W. Abu Hamra
W. DARUEN
W. El Ku
W. Elbo
W. Saiyah
Tagabo Hills
Berti

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163

25 26 27 28

16 15 14 13

Teiga Plateau

W. Mokgur

Meidob Hills

W. Shaqq el Gleifer

Hills

Tagabo

Berti Hills

W. Elbo

W. Sariyah

Mellit

W. Beida

Kordofan Prov.

Khursit

Wana Hills

Umm Maraig

W. Tabol

Abyad.

El Fasher

Umm Kaddada

W. El Ku

Tawila

Tarnei

W. Abu Zuraiga

Dam Gamad

Hills

W. El Ku

W. Barora

83 82 81 80 79 78 77 60 61 62 63 28 29 4 6 158 27 26 25 24 23 22 21 160 159 7

CENTRAL DARFUR.

From the One Million International Map.

PHYSICAL FEATURES AND ENUMERATION PLOTS.

KEY.

Wadis — W. Wilgid

Roads recorded over

Other Roads

Mountains & Hills — Berti Hs.

District H.Q. Names Underlined.

Vegetation Enumeration Plots thus - •95.

Sileaia
Vi. Beriefar (WADI)
Adre
Geneina
W. Kaja
W. Borgu
W. Barei
W. Bolli
Misterai
Marnai
W. Azum
Zalingei
W. Sania (Azum)
W. Kaja
Beida
Arara
Habila
W. Seiri
Dereisa
Kargula
Gallabat
W. Kaja
W. AZUM
W. Bebarei
Mogoroto
W. Saleh
Kubbum
Gaessia
Kebkabiya
Gurgei Hills
Kara Simbil
Turra
Gurgur
GULDU
MARRA MASSIF
Nyertereri
Derriba
Kebe
W. Kaja
Kas
Limo
Kalokitting
W. Bulbul
W. Bulbul
Tullus
Tina
Tawila
Dariya
Dobo
Genalag Hills
Sunc
Kidingir
W. Amer
Tarnei
W. Abu Zureiga
Melemm
Nyala
W. Umm Kavdus
W. Nyala
El Fasher
W. El Ku
W. Tabos
Wana Hills
Umm Marahig
Mellit
W. Beida
Khurait
W. Abu Hamra
W. Daforis
Minawaskei
Moshu
W. Amer
W. Wilgia
Mahugeriya
Beringil
W. El Ku
Wada'a
Umm Kutkut
Umm Saun
Daein
W. El Ku
W. Daforis
W. Wilgia
W. Amer
W. Bulbul
W. Hasseia
W. Bulbul
W. Nyala
W. Umm Kavdus
W. Abu Hamra
W. Daforis
W. El Ku
W. Wilgia
W. Amer
W. Bulbul
W. Hasseia

Khureit

Kordofan Prov.

14

Abyad.

Umm Kaddada

Dam Gamad

13

da'a

70

69

68

67

Umm Kutkut

66

65

64

63

58

57

56

55

Umm Hosh

Gabir

59

Taweisha

60

61

62

Umm Sauna

Heskanita

Ghabeish

12

Daein

Abu Matarig

11

26

27

28

KEY.

Wadis — W. Wilgid

Roads recorded over

Other Roads

Mountains & Hills — Berti Hs.

District H.Q. Names Underlined.

Vegetation Enumeration Plots thus - •95.

SCALE

1 to 1,000,000

1 Inch to 15·78 Miles,
or
1·014 Inches to 16 Miles.

10 5 0 10 20 30 40 50 MILES

10 5 0 10 20 30 40 50 60 70 80 KILOMS.

D. McC. Ramsay. 1953.

CHAPTER II.

GEOLOGY.

The basic material of this chapter is taken from Andrews (1948).

The table below gives the order of succession of the various formations which build the Sudan. (Certain details which do not concern Darfur have been omitted).

Quarternary	Recent	Nile valley alluvium
		(12) Kordafan and Darfur sand - Qoz. (Clays of plain contemporaneous)
	Pleistocene	Palaeolithic gravels bordering Nile
Tertiary	Pliocene	(11) Umm Ruwaba Series ↑ (10) Volcanicity ↑
	Miocene	Rise of Red Sea hills and Abyssinian plateau.
	Oligocene	Ironstone phase in south.
		Hudi Series (chert)
	Eocene	Beginning of rise of eastern plateau
		(9) Erosion gap
Mesozoic	Cretaceous	(Nubian series of north-west Sudan
	Jurassic	(8)
		(Nubian series of eastern Sudan
	Triassic	(7) Erosion gap: no major movement.
Palaeozoic	Upper Palaeozoic	(6) Continental sandstone of Ouadai - Darfur frontier.
	Lower Palaeozoic	(5) Establishment of peneplain under quasi-horizontal continental sediments, of Nubian series type.
		(4) Soda-granites
Pre Cambrian		(3) Unfoliated granites
		(2) Last folding of basement complex
		(1) Basement complex

The numbers in parenthesis refer to sections in the text which follows.

The platform on which the Nubian Series of quasi-horizontal sandstones and mudstones was deposited is of folded, more or less altered (metamorphosed and recrystallised) sedements and bedded volcanic rocks (1-4). They were altered, folded and intruded by igneous rocks, elevated to form a land surface and denuded to form the sub-Nubian peneplain.

The last folding of the basement complex occurred in Pre-Cambrian times (2). Non foliated granite intrusions (3) of which the soda-granites (4) are the latest, were intruded in the Lower Palaeozoic, while in Upper Palaeozoic times and later, this mass was denuded to form a peneplain (5 and 7). For the purpose of making field notes in the course of the present investigation, anything earlier than Nubian Series has been referred to as Basement Complex.

A small area of Palaeozoic sandstone (6) occurs on the north-west frontier of Darfur, north of the Wadi Howar. It is devoid of marine fossils. This formation was not encountered in the present work.

The whole land surface was innundated by the sea during the deposition of parts of the Nubian series, though the innundation appears to have been of an oscillatory character, and the sea was never deep. The Nubian series (8) of the north-west Sudan was laid down in Cretaceous times (subsequent to that of the eastern Sudan). The sea margin retreated steadily through the Eocene period, and the country was under sub-aerial erosion (9) for a long period of time (probably since the Cretaceous). This accounts for extensive tracts being swept clear of the Nubian deposits.

The occurrence of millet-seed sand and sandstone in the Nubian series does not support the contention that it is of dune (wind) formation. Further, it is everywhere sensibly horizontal. The succession was laid down on an irregular land surface and is thicker in the former basins.

The/

The ironstone phase did not touch Darfur in the main, but was concentrated on the plains to the south and west of the Bahr el Arab. The main ironstone phase is regarded as mid-tertiary. Evidence from bores has shown it to be younger than the "Umm Ruwaba" deposits.

Following the lateritic ironstone phase, volcanicity (10) began along the Marra range, to Matariq, north-west of Kutum, and north of Mellit as far as Meidob. (Volcanic activity on the Abyssinian plateaux is contemporaneous). The predominant rock is a basalt, but trachyte and phonolite are locally common in the Marra range and on the Berti (Tagabo) hills.

The volcanic period is generally regarded as having begun in the Upper Tertiary (Miocene). Volcanicity may have continued up to, and even into, the Pleistocene, although there is no direct evidence on this point other than the fresh appearance of some of the Marra craters.

Associated with the volcanicity which took place in Tertiary times, there is assumed to have been a general flexuring which produced an uplift in the Nuba mountains region of Kordafan, and a great depression roughly encircling these mountains to the east, south and west. The north-western extremity of this depression reaches into Darfur. These depressions were filled in by the water-borne deposits which make up the Umm Ruwaba Series (11). These sediments consist of unconsolidated sands and clay-sands, some gravelly. They are generally unsorted.

The age of the Umm Ruwaba series is not precisely fixed. It is younger than the mid-Tertiary peneplain, but may have continued well into the Pleistocene. It is older than the clay of the plains and the 'qoz' sands, but whether followed by these immediately, or after a long period of time, is unknown.

The latest deposits which concern Darfur are the clay of the plains and the 'qoz' or fixed sand dunes (12). The clays/

clays are regarded as probably late middle Pleistocene or early upper pleistocene, while the 'qoz' sands are probably somewhat younger.

The 'qoz' is an accumulation of dune sand consisting largely of quartz grains. In the main it is derived from the break-down of the Nubian series of sandstones. It is found spread over the low ground of the west central Sudan, and the dunes are now stabilised.

Where the 'qoz' is in the form of a thick extensive sheet, there is practically no surface drainage, because rain is absorbed, and earlier drainage lines are oblitered, or dammed (as at El Fasher), thus forming a shallow, seasonal lake puddled with silt. During the early stages of the 'qoz' period, lakes were more common than at present. There are deposits of shelly freshwater limestone and diatom beds interbedded with the lowest 'qoz' sands in many parts of Darfur and northern Kordafan (cf. Chad.).

The clay of the plains is heavy, dark grey to dark brown; it develops deep cracks on drying and contains nodules.

It seems fairly certain that the clays are of alluvial or colluvial origin, and were laid down under a humid or moist environment in the low ground of river valleys. Apart from the valleys of certain wadis (Ku and Howar) the only examples of clay plains in the province are those of the Bahr el Arab right along the southern inter-provincial boundary.

It is interesting to speculate on the climatic conditions existing during the period in which the sand 'qoz' and clay plains were laid down. Certainly two distinct (and probably more) sand invasions can be recognised in the field, while study of clay sections reveals four and probably more different phases, each representing a different period of deposition.

Wayland and Leakey (1941) have shown that in Kenya and Uganda/

Uganda the basic climate in Quarternary times has consisted of wet periods alternating with dry ones. Each succeeding wet period was less wet and of shorter duration than the preceeding one, and each succeeding dry period appears to have been shorter, and possibly less extreme, than its predecessor.

The upper pleistocene part of this cyclical alternation and a rough indication of the order of time is tabulated below:

RECENT	Present climate		
	Nakuran minor wet	850 B.C.	
UPPER	Present climate	2,000 B.C.	NEOLITHIC
PLEISTOCENE	Makalian wet	2,000-6,000 B.C.	
(GLACIAL)	Dry	6,000-10,000 B.C.	
	Gamblian Pluvial	10,000-70,000 B.C.	PALAEOLITHIC

Presumably, the Sudan had an approximately similar climate during this period. The clay and sand depositions may have alternated in time; the clays being laid down in the Sudan equivalents to the Gamblian, Makalian and Nakuran wet periods, and the sand 'qoz' in the intervening dry periods.

Works cited:

Andrew, G. (1948), Geology of the Sudan, being Chap. VI of Agriculture in the Sudan, ed. Tothill, London, 1948.

Wayland & Leakey (1941) quoted in Chap. II of the Soil Conservation Committee's Report, Sudan Government, 1944.

22 24 26 28 16 14 12 10 9

Furawaiya
Tini
Karnoi
Umm Guru
Kulkus
Dor
Kutum
Meidob
Jebel Marra
Mellit
Wandi Hs.
Kherait
Abyad
El FASHER
Umm Keddada
Kobkabiya
W. KAJA
Adré
Geneina
W. Gaisi
Mornei
W. Azum
Zalingei
Rukuru
Kabe
MARRA
Melemm
Kidingir
Wada'a
W. Kaja
Garsila
Kas
Mogoroso
Nyala
Mahugeria
W. Bulbul
Taweisha
Ogr
Meekanisa
Kubbum
'Idd el Ghanam
Rahad el Berdi
Tullus
W. Bulbul
Ed Da'ein
Abu Gabra
Mugiad
Abu Matang
Fiboku
Burnu
Bahr el Arab
Safakia
Radom
Hofrat en Nahas
R. Ardo
Nyamlell

DARFUR PROVINCE

SCALE 1/2,000,000

1.014 INCHES TO 32 MILES.

GEOLOGY.

KEY.

SUPERFICIAL.

- FIXED SAND DUNES ('Q02').
- CLAYS PREDOMINANT.
- IRONSTONE
- LARGER ROCK MASSES UNDER THIN DEPOSITS.

SOLID.

- UMM RUABA SERIES
- TERTIARY LAVAS
- NUBIAN SANDSTONE
- BASEMENT COMPLEX.

ENLARGED EXTRACT FROM THE GEOLOGICAL MAP OF THE SUDAN (1-3000000) PUB. BY THE CHIEF OF THE GEOL. SURVEY, KHARTOUM 1958

D. Mac. Ramsay. 1953.

CHAPTER III.

SOILS.

This chapter describes in broad detail the various soils encountered in Darfur. It is based on the writer's field observations, supplemented by laboratory analyses taken from Jewitt (1949). In addition, a field description of the soil will be found in the notes accompanying each enumeration plot (Appendix 5). These descriptions were recorded at the time of measuring the plot, frequently with the aid of shallow soil pits or nearby exposed profiles or well sections.

The soils of Darfur can be divided conveniently into five main classes. These are:-

(1) Sedentary soils

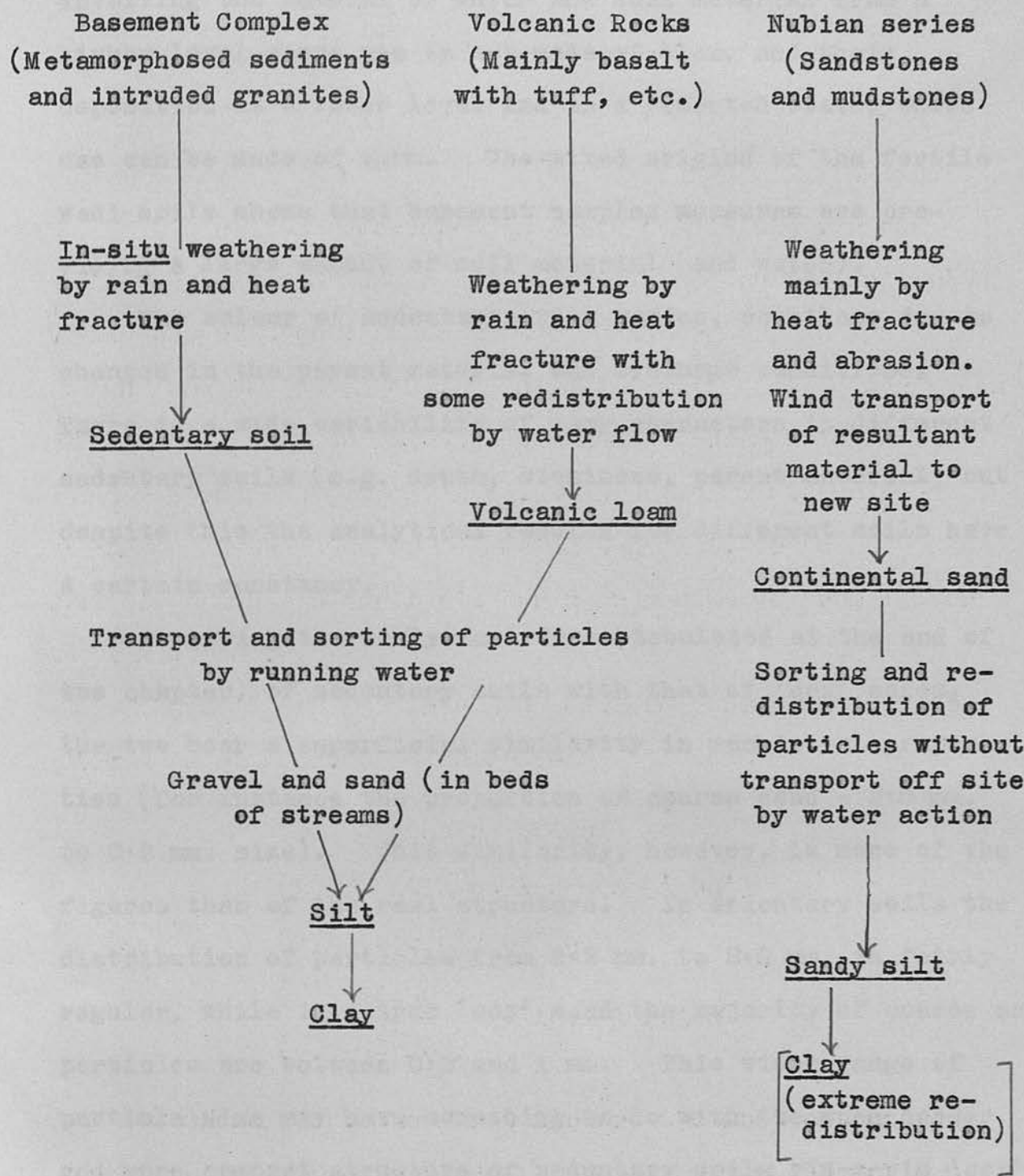
(2) Continental sands ('qoz')

(3) Volcanic soils

(4) Silts) Alluvial soils

(5) Clays)

Of these five, the first two are the most extensive forest soils in the province. The diagram which follows gives the relationships of the main soils to the principal geological strata, and the nature of the soil forming processes involved in their creation.



(1) Sedentary Soils.

On basement complex rocks there are large areas of soils developed in situ (hence the name 'sedentary'). These soils are neither deep nor well developed, but are extremely compacted and difficult to work. They are of low permeability, thus giving rise to rapid and intense run-off which can produce sheet and gully erosion on a wide scale.

This erosion is not man-made, but reflects topographical instability. It is really a process of land building involving/

involving the removal of water and soil material from a higher level where use is not made of them, and their deposition at a lower level and in a resorted state, where use can be made of them. The mixed origins of the fertile wadi soils shows that basement complex measures are providing a large amount of soil material (and water).

The colour of sedentary soils varies, doubtless due to changes in the parent material and drainage conditions. There is a wide variability of many characters in different sedentary soils (e.g. depth, stoniness, parent material) but despite this the analytical results for different soils have a certain constancy.

Comparing the analytical data (tabulated at the end of the chapter) of sedentary soils with that of 'qoz' sands, the two bear a superficial similarity in mechanical properties (for instance the proportion of coarse sand - 2·0 mm. to 0·2 mm. size). This similarity, however, is more of the figures than of the real structure. In sedentary soils the distribution of particles from 0·2 mm. to 2·0 mm. is fairly regular, while in a true 'qoz' sand the majority of coarse sand particles are between 0·2 and 1 mm. This wider range of particle size may have something to do with the much harder and more compact structure of sedentary soils vis-a-vis 'qoz' soils.

The sample analyses given at the end of the chapter, although few in number, are typical of the sedentary soils encountered throughout the province.

(2) Continental Sand (Qoz).

The superficial geology map shows the large area covered by this desert drift sand. It takes the form of dunes, now stabilised by vegetation, the longitudinal axes of which run sensibly north and south - i.e., they are oriented/

oriented with the long axis in the direction of the prevailing dry season wind. The parent material is Nubian sandstone which has been broken down into sand and transported to its present site by wind.

In the main it absorbes all the rain which falls and stores it until exhausted by growing plants. Intrinsically it is of low fertility, but despite this is one of the principal agricultural soils in the province. It produces good crops of bullrush millet, the staple grain crop of the western Sudan.

The sand qozes are deep soils with little profile development. The colour is typically reddish-yellow to reddish-brown. Mechanical analyses rarely shows more than 10% clay, and usually 80% of the particles are coarse and find sands, with a preponderance of the former. It is only very rarely that qoz soils contain particles larger than 2 mm. (i.e. stones and gravel fraction).

Chemically, they are poor soils, having low contents of phosphate, calcium and organic matter.

The first eight analyses given are of normal qoz soils in different parts of Central Darfur. The next four pits are from sands fringing the Wadi Golo silt plains near Fasher, and demonstrate abnormalities induced by excess water. The last five pits are from a transect running from high qoz to a small water channel, 20 miles north of Shingal Tobaia. They show the progressive decrease in sand content and increase in clay content as the lower sites are reached. This demonstrates the redistribution of particles down a sidelong slope by water action. It will be referred to again when dealing with the distribution of vegetation on sands.

(3) Volcanic Soils.

These are confined to the mountain region in the main, but may find their way, as silts, to the terraces and deltas of streams flowing out from Jebel Marra. The soil is derived from the breaking down of basalt lavas and the weak volcanic tuff which latter covers the upper levels of parts of the Marra range to a depth of over 100 feet. The hill-side and plateau mountain soils are formed in situ, the former doubtless with addition or loss of colluvial material. They are deep soils, some even on steep slopes having a considerable depth. They contain relatively small amounts of coarse material, indicative of a considerable degree of weathering.

The seven analyses tabulated at the end of this chapter are typical of this soil type.

(4 and 5) Alluvial Soils.

These are recent deposits, and have been laid down in general only to a narrow depth along the banks of the larger watercourses (silts) or in the terminal deltas of these water-courses (clays). The silts are the most fertile soils in the province, being used for high-demanding crops such as tobacco, vegetables and fruit.

They are soils of mixed origin. Basement complex material from sedentary soils plus, in the case of wadis flowing from the mountains, volcanic material, are the two commonest constituents. The coarser materials are deposited first from the water suspension, and the finest last. Thus down the length of the wadi as the gradient becomes flatter and the velocity less, the soils of the banks and flood plains become increasingly clayey. Five of the analyses given at the end are of comparatively swift flowing wadis, at/

at the place of sampling, and in consequence have a lower proportion of fine particles than the last two pits which were in more mature silty-clay plains.

Works cited:

Jewitt, T. N. (1949), Note on the Soils of Darfur, Sudan Govt., Agr. Research Div. Misc. Paper 37a, 1949.

EXPLANATION of SYMBOLS used in the TABLES of LABORATORY DATA.

SG:	Stones & Gravel	- larger than 2.0 mm.
CS:	Coarse sand	- 0.2 to 2.0 mm.
FS:	Fine sand	- 0.02 to 0.2 mm.
Silt:		- 0.002 to 0.02 mm.
Clay:		- smaller than 0.002 mm.

Salts: Conductimetrically.

Exch. K: Exchangeable potassium in m.g. equiv. per 100 g. soil.

Exch. Ca: Exchangeable calcium in m.g. equiv. per 100 g. soil.

P_2O_5: Available phosphoric acid by Truog's method, in parts per million.

N: Organic nitrogen, in parts per million.

C: Organic carbon by Walkey-Black method.

ANALYSES of SEDENTARY SOILS.

Sample No.	Depth.	SG %	CS %	FS %	Silt %	Clay %	Salts %	Exch K.	Exch Ca	pH	P2O5	N	C %	Site and Remarks
50	0-6"	2	56	25	2	15	0.033		5		50	230	.14	Yellowish-red soil from
51	6-12"	3	47	28	2	20	.054		6		50	250	.17	near Mellit.
97	0-6"	3	61	23	4	9	0.07	.25	1	7.20	20	240		
98	6-12"	2	35	36	7	20	.05	.15	2	6.70	20	255		12 miles west of Kutum on
99	12-18"	3	33	32	6	25	.07	.25	3	6.75	20	295		Kebkabiya road.
100	18-24"	5	44	26	5	20	.06	.25	4	6.75	20	225		
101	24-30"	2	38	32	5	21	.05	.40	4	7.00	20	225		Sampled to bed rock.
102	30-36"	21	35	25	5	15	.04			7.00	20	211		
103	36"+	26	44	17	4	9	.06			7.20	20	145		
120	0-6"	41	18	18	8	15	.10	0.70	7.9	8.05	40	1260		Red soil 5 mls. south of
121	6-12"	24	22	18	11	24	.07	.30	8.5	7.95	30	650		Kebkabiya. Large quartzes
122	12-18"	7	24	27	18	24	.06	.20	11.2	8.10	30	320		scattered throughout profile.
123	18-24"	1	23	26	22	27	.06	.20	9.8	8.15	30	350		
135	0-15"	52	20	14	3	12	0.06			7.65	70	1550	1.46	
36	15-30"	59	16	8	3	15	.05			7.05	40	550	.34	Brown soil. Profile exposed
37	30-42"	57	22	9	3	15	.08			7.40	20	145	.20	on large water-course.
38	42-54"	41	31	9	4	16	.24			7.90	30	270	.15	30 mls. south of Kebkabiya.
39	54-66"	26	40	12	5	18	.43			8.25	20	165	.11	
140	66-72"	33	27	14	9	17	.56			8.90	20	164	.125	

ANALYSES of QOZ SOILS (1)

Sample No.	Depth.	SG %	CS %	FS %	Silt %	Clay %	Salts %	Exch K.	Exch Ca	pH	P_2O_5	N	C %	Site and Remarks
12	0-7"	0.3	54	33	1	11	0.012		2	7.3	30	140	0.09	7 mls. north of Fasher.
25	0-9"	0	75	20	1	14	0.006	0.1	0.5	6.45	20	145	0.045	28 mls. north of Fasher.
319	0-6"	0	55	41	1	3	.005			7.3		195		1 mile east of Nyala.
20	6-12"	0	63	32	1	4	.005			7.4		170		
21	12-18"	0	52	43	1	4	.005			7.4		170		
22	18-24"	0	67	27	2	4	.005			7.4		165		
23	24-30"	0	64	32	1	4	.005			7.5		155		
24	30-36"	0	62	32	1	5	.010			7.4		155		
325	0-6"	0	53	39	2	6	.011			8.25		285		2 miles east of Nyala.
26	6-12"	0	58	32	2	8	.008			7.85		200		
27	12-18"	0	56	31	2	10	.007			7.75		195		
28	18-24"	0	56	33	2	9	.007			7.35		185		
29	24-30"	0	60	29	1	10	.010			7.15		225		
30	30-36"	0	56	33	2	9	.008			7.00		190		
349	0-6"	0	55	36	5	4	.007			7.05			.140	20 miles N. of Melemm on
350	6-12"	0	52	42	1	6	.006			6.60			.135	Fasher road.
368	0-6"	0	66	27	2	6	.03							10 miles N. of Shingal Tobaia
69	6-12"	0	73	18	1	7	.03							(i.e. 50 miles S. of Fasher)
479	0-12"	0	62	31	1	6	0.006			7.65	20	165	0.026	Fasher.
80	12-24"	0	72	21	1	6	.006			7.15	20	140	.030	High sand dune.
81	24-36"	0	71	22	1	6	.006			7.20	20	145	.024	
82	36-48"	0	70	26	0	4	.013			7.65	20	155	.015	
83	48-60"	0	74	20	1	5	.017			7.10	20	100	.013	
84	60-72"	0	81	13	0	4	.016			6.60	20	120	.010	
85	72-84"	0	68	26	1	5	.013			7.60	20	125	.010	
86	84-96"	0	75	20	1	5	.010			7.05	20	114	.003	
87	96-99"	0	76	18	1	5	.010			6.95	20	235	.008	
88	99-104"	10	55	28	1	4	.010			7.45	20	215	.010	
89	104-110"	0	68	25	1	5	.009			7.25	20	145	.008	
379	0-6"	0	54	29	4	13	0.01			7.30		230		Near Qoz Beina
380	6-12"	0	64	25	2	10	0.01			7.51		145		i.e. 30 miles S of Fasher.

ANALYSES of QOZ SOILS (2)

Sample No.	Depth.	SG %	CS %	FS %	Silt %	Clay %	Salts %	Exch K.	Exch Ca	pH	P_2O_5	N	C %	Site and Remarks.	
437	0-6"	0	78	18	1	3	0.01		15	7.07	40	140	0.060	Normal apart from CS to FS high.	A series of holes taken on the sand dunes beside the Wadi Golo silt plain, west and south of Fasher.
38	6-30"	0	61	27	2	10	.00		20	6.70	20	135	.055		
39	30-43"	0	59	28	2	11	.01		30	7.60	10	145	.040		
40	43-61"	0	75	21	1	3	.01		35	8.70	50	155	.030		
462	0-12"	0	61	31	2	5			1.5		50	150	0.08	All contain mica. Profile shows leaching with depth.	
63	12-24"	0	58	32	2	9			1.5		170	105	.04		
64	24-36"	0	66	26	2	7			1.5		40	145	.05		
65	36-48"	0	59	29	3	8					20	145	.04		
66	48-60"	0	61	27	3	8					20	155	.04		
453	0-13"	0	44	32	5	18	0.03			7.20	800	580	0.480	Normal sand dune with a rib of alluvium at 13"-31".	
54	13-31"	0	13	22	31	33	.03			8.45	340	410	.225		
55	31-43"	0	58	28	3	11	.024			9.00	400	200	.070		
56	43-55"	0	66	21	4	10	.018			8.70	270	160	.070		
57	55-67"	0	62	25	3	10	.015			8.80	100	170	.060		
473	0-12"	0	72	21	1	6	0.01			7.60	20	180	0.070	Hole furthest from Golo. Normal qoz. Note normal low clay and phosphate values.	
74	12-24"	0	28	64	1	7	.00			6.85	20	175	.050		
75	24-36"	0	67	25	1	7	.00			6.20	20	170	.040		
76	36-48"	0	70	22	1	7	.00			6.85	20	120	.030		
77	48-60"	0	69	23	1	8	.01			6.80	20	130	.040		
78	60-72"	0.8	60	29	1	9	.01			7.80	20	125	.035		
373	0-6"	0	63	32	2	3	0.007			7.45		140		18 yds. from khor.	Qoz to Water-course series.
374	6-12"	0	71	23	4	2	.01			7.55		220			
375	0-6"	0	69	27	1	4	0.01			7.65		210		13 yds. from khor.	
376	6-12"	0	79	16	1	4	.01			7.90		230			
370	0-6"	0	30	62	1	6	0.03			7.80		285	0.21	8 yds. from khor.	
371	6-12"	0	58	33	1	8	.03			7.10		240	.16		
372	12-18"	0	63	30	1	7	.03			7.55		175	.15		
377	0-6"	0	48	21	5	25	.01			6.70		328		At stream edge.	
378	0-6"	0	39	19	7	35	.02			5.70		820		Middle of stream bed	

ANALYSES of VOLCANIC SOILS.

Sample No.	Depth.	SG %	CS %	FS %	Silt %	Clay %	Salts %	pH	P_2O_5	N	C %	Site and Remarks.
204	0-6"	14	44	25	9	7	0.05	6.25	115	670		Nyertetie lower plain below rest house.
205	6-12"	16	47	24	8	5	.03	6.45	35	280		
206	12-18"	3	26	39	22	9	.05	6.7	50	335		
207	18-24"	8	33	28	16	15	.02	6.65	45	330		
208	24-30"	9	32	24	21	14	.04	6.4	30	380		
209	30-36"	27	32	16	13	13	.05	6.65	30	380		
210	36-42"	18	39	14	15	13	.05	6.95	30	485		
211	42-48"	11	42	17	16	13	.09	6.9	35	320		
212	48-54"	66	19	9	3	3	.03	7.55	60	360		
213	54"+	55	37	5	2	1	.03	7.75	75	245		
203	0-11"	8	32	34	12	13	0.04		50	490		Kebe plateau ($\frac{1}{2}$ ml. N. of Kebe)
247	0-6"	5	29	46	7	14	0.02	6.95	400	505		Guldu
248	6-12"	6	18	44	12	20	.03	7.05	600	420		
249	12-18"	4	14	48	13	21	.08	7.15	600	395		
250	18-24"	2	17	50	13	18	.02	7.35	600	290		
251	24-30"	2	19	47	13	18	.04	7.35	600	350		
315	0-11"	5	4	30	21	39	0.03	7.05	750	785	0.45	Suni hill terraces
316	0-6"	19	15	30	17	20	0.03	7.05	920	740		
317	6-13"	32	8	18	19	22	.04	6.9	920	570		
318	0-8"	11	17	30	20	22	0.02	7.15	400		0.115	
319	0-6"	11	55	17	8	9	0.04	7.0	320			Suni, Government garden.
320	6-12"	16	45	19	10	10	.03	7.2	305			
321	12-18"	18	54	12	9	7	.03	7.1	255			
322	18-24"	22	45	15	10	8	.04	7.7	310			
323	24-30"	7	63	14	8	7	.04	7.5	140			
324	30-36"	7	68	12	6	6	.03	8.2	85			
325	36-42"	7	70	13	5	5	.02	8.05	100			
326	42-48"	2	70	13	8	7	.02	7.95	105			
327	48-54"	16	58	11	6	8	.03	7.7	100			
328	54-60"	7	70	11	7	5	.04	8.5	120			
329	60-66"	6	70	12	8	3	.03	9.05	90			

ANALYSES of ALLUVIAL SOILS.

Sample No.	Depth.	SG %	CS %	FS %	Silt %	Clay %	Salts %	Exch K	Exch Ca	pH	P_2O_5	N	C %	Site and Remarks.	
143	0-7"	0	16	65	5	14	0.03	0.35	7	6.95	85	710	.67	Wadi Aribo, Inside proposed forest reserve N. of Zalingie.	Flood plains of comparatively swift flowing wadis.
144	7-11"	0	14	57	10	19	.06	.60	8	6.60	85	660	.69		
145	11-16"	0	10	17	6	14	.04	.40	7	7.10	85	370	.30		
174	0-6"	1	5	61	16	17	0.03			7.25	145	810		Kargula. 20 mls. west of Zalingie. Flood plain of Wadi Azum.	
175	6-18"	0.2	6	69	13	13	.02			7.20	175	325			
176	18-30"	0.2	7	70	12	11	.02			7.30	130	265			
177	30-42"	0	6	47	24	23	.04			7.35	130	420			
178	42-54"	0	2	43	25	30	.06			7.65	145	520			
151	0-7"	0	20	52	9	19	0.16		17	6.75	125	2400	3.12	Wadi Azum flood plain, 4 mls. north of Zalingie.	
152	7-9"	0	3	43	19	34	0.07		22	7.00	125	3100	2.70		
153	9-15"	0.3	73	23	1	2	.02		1	7.55	50	180	0.11		
300	0-6"	3	26	30	12	30	0.22			8.55		2100	0.33	Wadi Nyala flood plain, S. bank, 1 ml. west of Nyala town.	
301	6-14"	13	69	10	2	6	.06			8.35		410	.265		
302	14-18"	16	75	7	0	2	.015			8.30		100	.040		
303	18-33"	0	42	30	9	19	.07			8.25		660	.595		
304	33-53"	20	76	4	0	1	.11			8.90		125	.020		
305	53-70"	11	80	7	0	2	.11			8.74		125	.020		
67	0-12"	11	34	38	5	11	0.13		22		920	965	.735	Wadi Kutum.	
68	12-24"	14	46	30	4	7	.044		8		190	245	.160		
69	24-36"	8	33	42	6	11	.043	0.35	7		100	230	.215		
70	36-48"	9	21	46	9	15	.040	.50	12		70	290	.235		
71	48-60"	0	15	60	9	16	.038	.70	8.5		100	215	.185		
353	0-6"	0	16	45	13	27	0.09			8.00		565		Shingal Tobaia plains. Silty-clay Semi-delta.	Slower flowing more mature watercourses. Higher clay content.
354	6-11"	0	65	27	2	6	.02			8.55		115			
355	11-20"	0	19	41	12	28	.08			8.30		515			
356	20-25"	0	10	50	16	24	.07			8.65		355			
357	25-31"	0	1	46	19	34	.14			8.20		555			
358	31-40"	0	10	56	11	23	.07			8.20		420			
359	40-52"	0	8	36	16	40	.12			8.15		560			
360	52-64"	0	4	25	12	60	.05			8.45		280			
382	0-15"	0	54	34	4	9	0.01		9	7.65	600	160	.100	Wadi Golo W.S.W. of Fasher wide silty clay plain.	
383	15-50"	0	2	30	29	40	.03		28	8.70	540	270	.190		
384	50-70"	0	0	59	15	26	.03		21	8.45	540	190	.120		
385	70-76"	0	1	67	12	20	.03			8.95	670	155	.090		

C H A P T E R IV.

CLIMATE.

Compared to the eastern provinces, the central region and north of Darfur are relatively cool. The southern district, with the exception of the Marra mountains, is hot. Much of the province is high, which is undoubtedly a contributing factor to the coolness.

There are only four meteorological stations in the province at el Fasher, Geneina, Nyala and Zalingei. At the first two maximum and minimum air temperatures are recorded, plus the relative humidity at 0800 hrs., the daily Piche evaporation, and the wind direction. The two latter stations record only maximum and minimum air temperatures and wind direction. Rainfall is recorded at nineteen stations throughout the province. The four meteorological stations and fourteen of the rainfall stations fall within the central zone as here defined.

The different phenomena are treated separately below.

1. Temperature.

Table I shows the temperature range at four places in the province. It will be noted that the range is greater in the north (Fasher) than in the south (Nyala). This follows from Fasher having a lower rainfall than Nyala, and also being nearer to the desert. Zalingei, although midway between Fasher and Nyala (but to the west of the Marra range) does not have intermediate temperatures, but has appreciately lower minima throughout the year, and lower maximum during the rains. The reason for this is probably altitude, since Zalingei is approximately 1000' higher than both Nyala and Fasher.

Table I./

Table I.

Monthly Mean Maximum & Mean Minimum Air Temperature in °F.

	FASHER		NYALA		GENEINA		ZALINGIE	
PERIOD	1918-47		1940-46		1938-47		1943-46	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
January	88	49	89	61	92	53	92	45
February	91	53	92	63	95	56	95	45
March	97	58	95	67	97	61	98	53
April	101	64	99	71	101	67	99	56
May	101	69	99	73	101	69	99	63
June	102	72	96	73	99	70	94	65
July	96	71	90	70	91	70	87	63
August	92	69	87	70	86	67	83	61
September	96	69	94	69	92	66	88	61
October	98	65	96	69	96	62	93	58
November	94	56	93	65	94	58	94	46
December	89	51	90	61	92	52	93	43
Year	96	62	93	68	95	63	93	55

2. Rainfall.

In general, the rainfall increases from north to south, e.g., Fasher 298 mm. to Myala 498 mm. in a distance of 110 miles.

This general picture is, however, complicated by the presence of the mountain masses. Kutum, to the north of Fasher, has an annual rainfall of 351 mm., while Guldu and Zalingei to the west of the Marra massif (i.e. in the rain shadow) have 668 mm. and 639 mm. respectively, Guldu being further north, but much nearer to the massif than Zalingei.

The effect of the mountains on the rainfall is brought out very well in the map of the isohyets (at end of chapter). This map has been drawn by the writer, and differs in certain respects from that published by the Met. service and covering the whole country. (Also at end). One difference is that being on a much longer scale, it is able to depict minor or local deviations from what on the smaller scale map would be a straight or smoothly curving isohyet. The main difference, however, is that the Met. Service map is based on information up to 1940 only, at which time there were only five rainfall recording stations in the province, none of which were in or even/

even very near to the central mountain region. Since 1940, 14 additional stations have been established all over the province, and data from all these stations has been used in preparing the writer's map.

The general picture of the rains can be divided into three phases. First a phase of sporadic showers gradually increasing in intensity from April to June. Second, the period of the main rains typically July and August over most of the province, although in the very south, where the total fall is 900 mm. and over, this period extends from mid-May to September. Finally, a period of declining intensity, which, over the main part of the province, occurs in September tapering off to an occasional shower in October.

In the subjoined tables the stations are arranged first by main zones, and within each zone the stations are listed, starting with the most northerly and proceeding southwards, i.e., in general in order of increasing rainfall.

Table II.

Monthly and Annual Rainfall in mms.

A. 50 mm. to 300 mm. Zone.

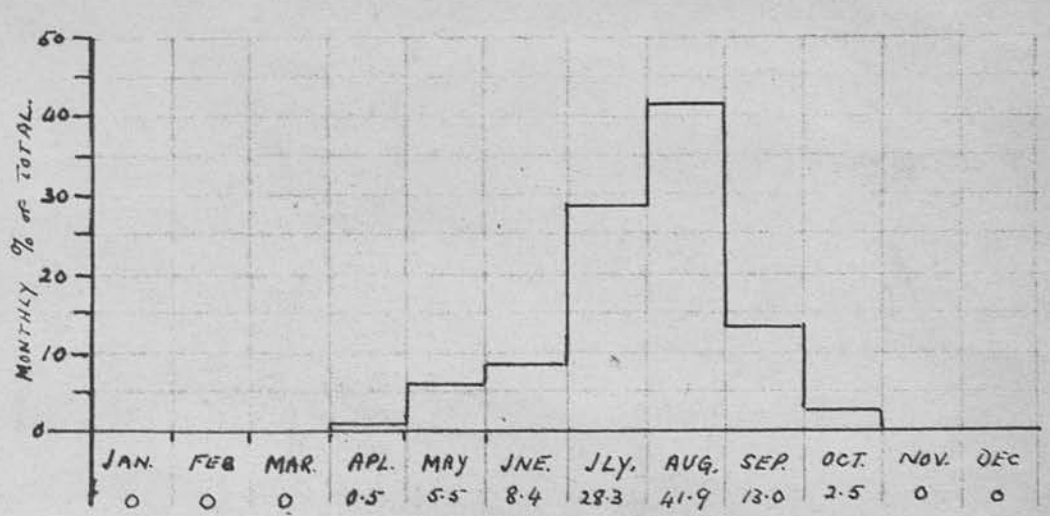
STATION	MELLIT	UMM KEDADA	FASHER
POSITION	14° 09' N. 25° 33' E.	13° 36' N. 26° 41' E.	13° 38' N. 25° 21' E.
ALTITUDE	2700'	2300'	2427'
PERIOD	1948 - 1951	1945 - 1949	1918 - 1947
January	-	-	-
February	-	-	-
March	-	-	-
April	-	-	1
May	9	29	12
June	16	9	16
July	98	41	101
August	131	137	129
September	24	19	33
October	8	-	5
November	-	-	-
December	-	-	-
Year	286	236	298

B./

B. 300 mm. to 500 mm. Zone.

STATION	KUTUM	KEBKABIYA	WADAA	TAWEISHA	NYALA
POSITION	14° 12' N 24° 40' E	13° 39' N 24° 05' E	12° 51' N 25° 45' E	12° 17' N 26° 42' E	12° 03' N 24° 53' E
ALTITUDE	3800'	4570'	2250'	2300'	2214'
PERIOD	1929/49	1942/49	1948/49	1946/49	1920/49
January	-	-	-	-	-
February	1	-	-	-	-
March	-	-	-	-	-
April	2	1	4	-	4
May	13	10	14	37	36
June	11	16	31	55	58
July	120	114	86	84	127
August	165	176	190	106	170
September	38	41	12	83	84
October	2	6	6	19	18
November	-	-	-	-	-
December	-	-	-	-	-
YEAR	351	364	343	383	498

The monthly distribution of rainfall in this zone (which comprises the northern part of the central zone) is given in the diagram below - that is monthly fall expressed as a percentage of total fall. The figures used in constructing the diagram are the arithmetic means of the monthly rainfall for each of the recording stations in the zone, plus El Fasher to the immediate north of the zone.



C./

C. Zone of over 500 mm.

This zone is divided into three sections.

(i) Plains stations within the central zone.

(ii) Mountain stations within the central zone.

(iii) Plains stations to the south of the central zone.

C (i) Central plains.

STATIONS	GENEINA	ZALINGEI	KAS	GARSILA
POSITION	13° 27' N 22° 27' E	12° 54' N 23° 59' E	12° 31' N 24° 17' E	12° 22' N 23° 09' E
ALTITUDE	2640'	3350'	3000'	3050'
PERIOD	1928/49	1929/49	1949/49	1943/49
January	-	-	-	-
February	-	-	-	-
March	6	8	5	6
April	24	36	33	51
May	47	75	62	84
June	167	175	152	184
July	228	227	200	268
August	69	100	99	145
September	5	18	18	33
October	-	-	1	-
November	-	-	-	-
December	-	-	-	-
YEAR	546	639	572	672

C (ii) Central mountain area.

STATION	GULDU	NYERTETEI
POSITION	13° 08' N 24° 09' E	12° 58' N 24° 04' E
ALTITUDE	4300'	4400'
PERIOD	1943/49	1943/49
January	-	-
February	-	-
March	-	-
April	4	-
May	39	23
June	51	114
July	201	206
August	289	298
September	78	133
October	6	-
November	-	-
December	-	-
YEAR	668	771

C (iii)/

C (iii) South plains.

STATIONS	KUBBUM	DAEIN	IDD EL GHANAM	BURAM	RADOM
POSITION	11°48' N 24°47' E	11°26' N 26°10' E	11°29' N 24°21' E	10°49' N 25°10' E	9°54' N 24°50' E
ALTITUDE	2000'	1900'	1600'	1600'	1600'
PERIOD	1943/49	1943/49	1943/49	1940/49	1943/49
January	-	-	-	-	-
February	-	-	-	-	-
March	7	-	-	-	10
April	34	4	1	6	5
May	76	47	39	41	90
June	194	55	81	87	123
July	224	126	163	176	159
August	119	182	154	224	292
September	30	103	97	109	172
October	-	28	35	27	68
November	-	-	-	-	-
December	-	-	-	-	-
YEAR	704	546	570	667	919

3. Relative Humidity and Evaporation.

These Phenomena are measured at Fasher and Geneina only, (Airfield Meteorological Stations). The mean relative humidity % figures are for 0800 hrs. The Piche figures are in mms.

	EL FASHER		GENEINA	
	MEAN RELATIVE HUMIDITY %	MEAN DAILY PICHE EVAPORATION	MEAN RELATIVE HUMIDITY %	MEAN DAILY PICHE EVAPORATION
PERIOD	1918/1947	1918/1947	1938/1947	1940/1947
January	36	10.3	28	15.4
February	29	11.9	21	17.9
March	25	14.0	24	19.5
April	22	15.4	23	19.6
May	33	14.5	37	16.3
June	46	13.2	54	12.7
July	67	9.0	79	6.9
August	75	6.1	90	3.7
September	61	8.8	76	6.5
October	45	12.1	46	12.3
November	33	11.3	30	14.2
December	36	10.0	34	13.9
Mean Annual	48	11.4	45	13.2

The Piche evaporation figure multiplied by 0.5 gives the evaporation loss from a free water surface under still air conditions. With a wind blowing, the loss will be higher than the calculated figure.

4. Wind.

During the dry season, November to April say, the prevailing wind is from the north and north-east. Coming off the sandy wastes to the north, this is a dry wind, and frequently carries dust, causing local dust storms, especially in the more arid northern parts of the province.

The prevailing wind during the rains is from the south-west. This moist wind in rising to pass over the Marra massif produces orographical rain on the western slopes of the range.

The following table gives the prevailing monthly direction at each of the four stations where this phenomenon is recorded.

	FASHER	NYALA	GENEINA	ZALINGIE
January	N, NE	NE	N, NE	NE, E
February	N, NE	NE	N, NNE, NE	E, N
March	N, NE	NE	NNE, NE	E, NE
April	N, NE, E	NE	NNE, NE	E, NE
May	NE, E, SE	NE, W, SW	NE, SW	E, LV
June	SE, E	SW	SW	S, E
July	S, SE	SW, WSW, W	SW	W, SW
August	S, SE	SW, WSW, W	SW	W, SW
September	SE, NE	SW	E, NE	N, E
October	N, NE	NE	NE	NE
November	N, NE	NE	NNE, NE	NE
December	N, NE	NE	NE	N, NE

Data is from 1946 to 1951.

LV = Light variable.

5. Indices of Aridity.

This useful method of combining temperature and rainfall in one expression is taken from Thomas (1950) who developed it in connection with vegetation studies in the Belgian Congo.

The formulae are -

(i) Annual Index of Aridity.

$$A\ I\ A = \frac{Pa}{Ta + 10}$$

Where Pa = Annual precipitation in mms.
Ta = Mean Annual temperature in ^{o}C

(ii) Monthly Index of Aridity.

$$M\ I\ A = \frac{12\ Pm}{Tm + 10}$$

Where Pm = Monthly precipitation in mms.

Tm = Mean monthly temperature in ^{o}C

The Monthly and Annual indices for the four Meteorological stations in Darfur are given in the table below. In calculating the indices, the mean temperature figure used is the arithmetic mean of the mean maximum and mean minimum temperatures.

(i) Table of Monthly Indices of Aridity.

	FASHER	NYALA	GENEINA	ZALINGIE
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0.3	1.4	2.4	3.7
May	3.6	14.9	9.4	33.1
June	6.3	24.5	19.1	34.2
July	42.1	57.7	73.9	88.2
August	56.1	81.7	107.0	122.1
September	14.1	38.5	39.2	50.8
October	2.1	8.1	2.4	8.9
November	0	0	0	0
December	0	0	0	0

In the table of annual indices the data for Wau, Bahr el Ghazal province, is given for comparison. This station is lat. 7° 45' N, and is well within the broad-leaved deciduous savanna zone.

(ii) Table of Annual Indices of Aridity.

	FASHER	NYALA	GENEINA	ZALINGIE	WAU
Mean Annual Rainfall in mms.	298	498	546	627	1103
Mean Annual Temperature in ^{o}C	26.025	26.96	25.525	22.84	27.38
Annual Index of Aridity	8.3	10.8	15.4	19.0	29.5

(Indices in both tables correct to first place of decimals)

A graph of the monthly indices of the Darfur stations is given on the next page but one.

Works cited:

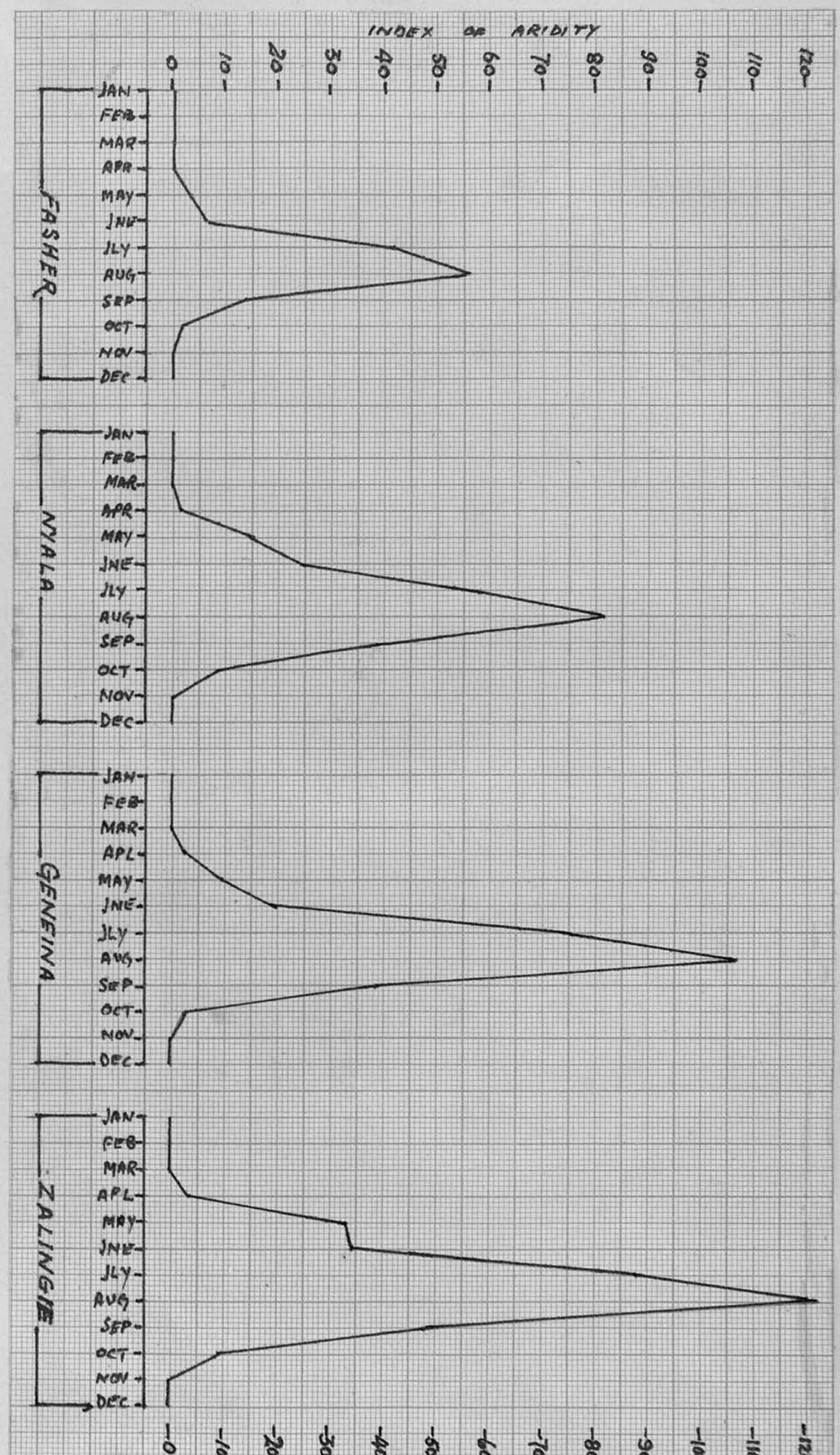
Thomas, R. (1950), Essai de classement des formations congolaises à végétation arborescente d'après le groupement de leurs indices mensuels d'aridité.

Bull. Agric. Congo Belge 41 (2) 1950

Abstracted in For. Abs. 12 (2) Abs 1000.

For the basic climatological data presented in this chapter, the writer is indebted to the Sudan Government Meteorologist, Khartoum.

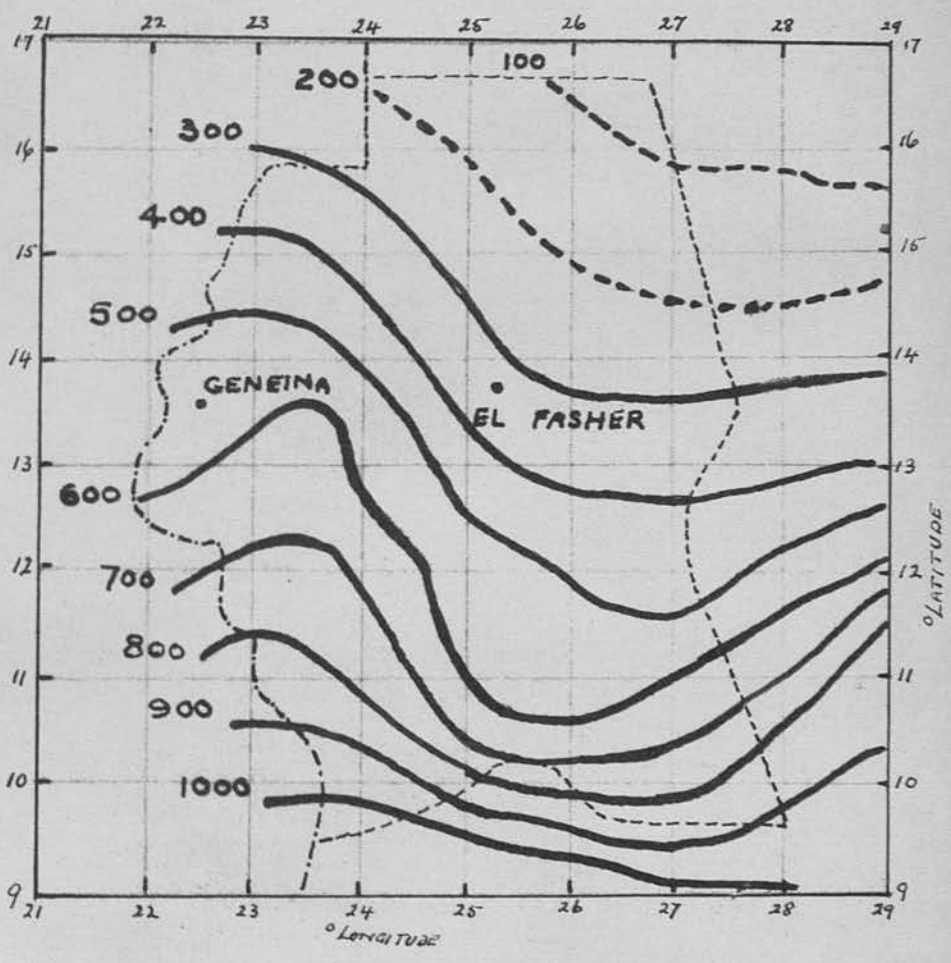
PLOT OF MONTHLY INDICES OF ARIDITY FOR CERTAIN STATIONS IN DARFUR.



EXTRACT FROM SUDAN MET. SERVICE MAP VI

MEAN ANNUAL RAINFALL (MM)

TO 1940.



DARFUR PROVINCE

SCALE 1/2,000,000

1.014 INCHES TO 32 MILES.

ANNUAL RAINFALL

IN MMS.

APPROXIMATE CONVERSION SCALE

MMS.		INCHES
100	–	4
200	–	8
300	–	12
400	–	16
500	–	20
600	–	24
700	–	28
800	–	32
900	–	36.

STATIONS AT WHICH RAINFALL IS RECORDED ARE UNDERLINED IN BLUE AND THE AVERAGE RAINFALL IS SHOWN ALONGSIDE.

MAP PREPARED BY : D. McC. Ramsay. 1953.

22 24 26 28

16 14 12 10 9

100 200 300 400 500 600 700 800 900

Meidob

Jebel Marra

Furawiya

Tini

Karnoi

Umm Buru

Kulbus

Dor

Kutum 351

Mellit 286

Wandi Hs.

Khesait

Abyad

EL FASHER 298

Umm Keddada 236

Kebkabiya 364

Adré

Geneina 546

W. Kajja

W. Azum

W. Kaja

Morneio

668 Eulubur

627 Zalingei

Kebeshi 711

830

700

Melem

Kidimpé

Wada'a 343

Kas 572

Garsila 672

W. Kaja

W. Azum

Taweisha 383

Mahugeria

Nyala 498

Mogororo

704 Kubbum

'Idd el Ghanam 570

Rahad el Berdi

W. Bulbul

Tullus

Ed Da'ein 546

Abu Gabra

Muglad

Abu Matang

Sibelu

Buram 667

Bahr el Arab

Safaka

Nyamlell

Radom 919

Hofrat en Nehas

R. Ariela

CHAPTER V.

POPULATION and LIVESTOCK.

Darfur is essentially a province of pastoral tribes, most of whom are nomadic in the dry season. Among the northern tribes the main livestock is camels, sheep and goats, while the tribes of the south are cattle owners.

The total area of Darfur is 138.150 square miles, and the estimated population is some 876,000. The town dwelling population is roughly 45,000, which leaves a rural population of 831,000. This represents a population density of 6·01 persons per square mile over the rural areas of the province. The comparable density of rural population over the whole Sudan (excluding desert and swamp from the total area) is 11·8 persons per square mile.

District by district, the population statistics are:-

District	Total Pop.	Town Pop.	Rural Pop.	Area Sq. mls	Density Rural Pop.
Central & Eastern	127,000	25,000	102,000	18,290	5.5
Northern	180,000	3,000	173,000	50,460	3.4
Southern	265,000	6,000	259,000	46,385	5.5
Western	150,000	3,000	147,000	14,170	10.3
Dar Masalit	153,000	8,000	145,000	8,850	16.3

The animal population of the province, to the nearest thousand, has been estimated by Hancock (1944) as follows:-

Camels	-	64,000
Cattle	-	531,000
Sheep	-	306,000
Goats	-	317,000

Stock figures are notoriously difficult to assess, but the above are accepted as being within ± 12% of the true figures.

The main tribes and their livestock are treated, by districts, below.

(1)/

(1) Northern District.

The main tribes are -

Northern Riziegat
Zaghawa
Zaiadiya
Meidob
Ben Hussein.

Together they are the largest camel owners in the whole province. Their probable holdings are 55,000 beasts, which represents a stocking of just over 1 camel per square mile, assuming the distribution to be even. This, however, is not the case. During the dry season the animals are concentrated around the few sources of permanent water in this arid region, and graze out the surrounding land. Harrison (1952) gives estimates of the animal concentrations in such areas and concludes that on the average it is 30 camels per square mile for 6 months of the year.

Additional watering facilities are required to make available areas of ungrazed grass and relieve the pressure on the present areas.

Sheep and goats and a certain number of cattle are owned in addition to camels.

In general, over the district as a whole, no permanent damage to the tree and shrub vegetation is done by animals. In the neighbourhood of permanent water supplies, however, over-browsing by stock has produced a noticeable thinning out of the natural vegetation. This process is aided by the inroads made by the herdsmen for firewood.

(2) Southern District.

This is the cattle country of Darfur par excellence. It is also justly famed for its horses. The main tribes are all of Arab stock and are -

Riziegat
Habbaniya
Fellata
Beni Helba
Taiesha

These are the "big five" cattle owners, mustering between them some half million cattle. They are semi nomads. Each tribe possesses a recognised homeland territory (Dar) but on the average they spend only two or three months per year in it. All these 'dars' are south of the central zone. In the dry season the tribes migrate southwards with their herds to the pastures on the Bahr el Arab. (The exception to this is the Beni Helba who go north into Western District and graze on the wadis during the dry season). The tribes return to their homesteads at the onset of the rains, but by the middle of the rains they are on the move again, this time northwards with their herds to escape the mud and flies of their own wetter 'dars'. Many of them go north-east into the sand country of eastern Darfur. There they stay for one to two months. This is the only time these large herds come into the central zone as defined in this paper, and their sojourn is of such short duration that no permanent damage accrues from it.

Around Nyala and in the northern part of the district, is the confederation of small tribes known as the Magdumiya. They are the Turgim, Dagu, some Fur and various small fragments of tribes. They are all sedentary agriculturists, rather than stock owners.

(3) Western District.

The main tribe is the Fur; Lowland Fur on the plains and Upland Fur on the slopes of Jebel Marra. They are an industrious race of cultivators and possess relatively few animals. They are the most careful cultivators in Darfur and probably in the whole Sudan. Contour terraces with stone retaining walls are constructed in agricultural land on steep slopes, and broad base shallow terracing is done on gentle slopes. The few animals they do possess, mainly sheep and goats, are penned at night and the manure spread on the land. In areas used by the Beni Helba for dry season grazing/

grazing, the cattle are allowed on to the Fur cultivations to eat the grain stalks and in return manure the area.

(4) Dar Masalit.

As the name implies, the main tribe is Masalit. In common with the Fur they are of non-Arab stock, and are cultivators more than stock owners. They own a relatively small number of cattle, sheep and goats. The northern part of the district is inhabited by the Gimr tribe. They own a certain number of camels, but are more sedentary than the Northern District camel owning tribes.

Dar Masalit is densely populated by Darfur standards (16.3 persons per square mile) and in general only subsistence level agriculture is practised, i.e., there is little surplus for sale and few cash crops. A large area of the lighter soils is under shifting cultivation, but except for the perimeter of Geneina town, few signs of over cultivation are to be seen.

(5) Central & Eastern District.

This comprises mainly the sands area from Fasher, east and south-east. The main tribes are Berti, Bergid and Ma'alia, with some Fur and Zaiadiya in the north. The Berti is the most important tribe. They are both cultivators and stock owners, the former being the more important line. Cultivation is carried on wherever permanent water supplies exist: these are usually in the form of government water bores of which there are six in the area under review. Colonisation of abandoned cultivation sites by Acacia senegal is rapid, and no deterioration in the vegetation results.

Livestock holdings are fair, but not excessive. They are generally in the nature of a small herd to supply the cultivator's own needs, and as a bank for his capital. Harrison gives the dry season stocking round water yards as 20 cattle per square mile, and states that the area is capable of carrying much more.

In/

In conclusion, it can be said that on the whole man and his domestic animals are not large scale destructors of the vegetation in central Darfur. In certain respects there is much room for improvement, particularly in regard to a wise land policy around the towns. The rural dweller and nomad on the other hand, while equally careless of his heritage, has so much wider an area in which to roam that his efforts at destruction pass almost unnoticed, and in general are soon recovered by nature.

Works cited:

Hancock, (1944), Animal Numbers in the Sudan, Appendix 26 of the Soil Conservation Committee's Report, Sudan Government, 1944.

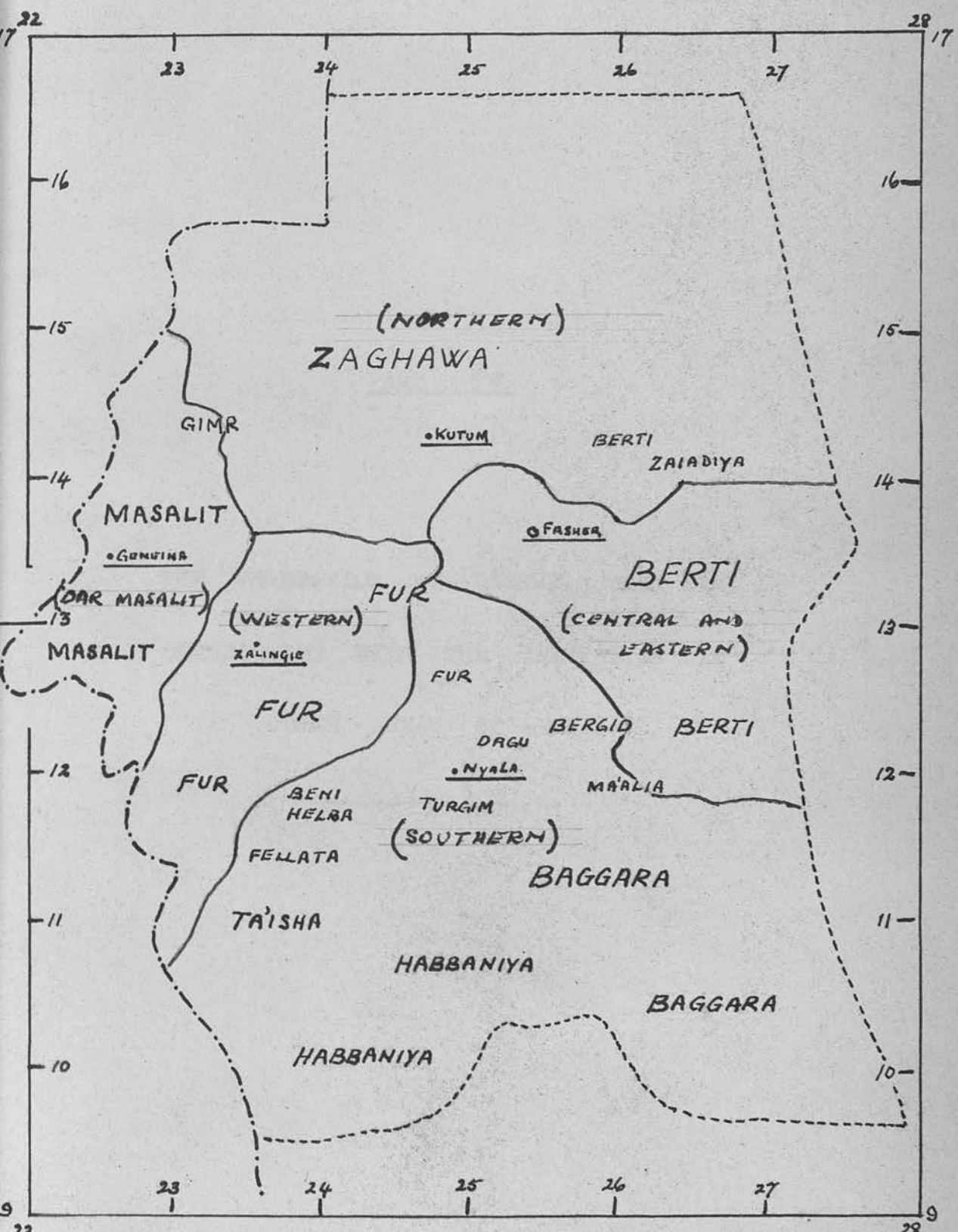
Harrison, M. N. (1952), Pasture Report, Sudan Vet. Service.

In addition to the above, the information on area and population is taken from the Sudan Almanack, 1953.

DARFUR PROVINCE.

SCALE Approx. 1/4,000,000

MAP SHOWING DISTRICTS & TRIBAL DISTRIBUTION.



Boundaries : —·—·— International.
------ Provincial.
——— District. (NAME)

Only District Headquarter Towns Shown — Underlined.

PART TWO.

THE VEGETATION of DARFUR, and its CORRELATION WITH THE VEGETATION in OTHER AREAS of AFRICA.

CHAPTER VI.

A REVIEW of RELATED STUDIES of AFRICAN VEGETATION as AFFECTING DARFUR.

There has been relatively little work done in the Sudan on the description and classification of forest vegetation. Only two publications will be noted here as dealing at all with Darfur. These are Smith's Distribution of Tree Species in Relation to Rainfall and Soil Texture, and Andrews' Vegetation of the Sudan.

Smith's work, as the title implies, deals mainly with the water and soil factors affecting tree distribution throughout the country. His theory is that in a sandy soil a greater proportion of the soil moisture is available to the plant than in a clay. Tracing any species through the whole of its natural range of occurance, he shows that at the drier end of its range it occurs on soils containing x% clay particles, while at the wetter end of its range its habitat is soils of y% clay content, and y is always greater than x. This theory fits the observed facts of tree distribution on varying sites under different rainfalls. It will be referred to again in the course of the present work.

The second work cited, Andrews' Vegetation of the Sudan, is a birds-eye view of the vegetation over the whole million square miles of the Sudan. Broad ecological zones, which are also usually climate zones, are defined and the main features and components of the vegetation of each described. Great detail on this scale is not possible. The full division into zones is given in the next chapter; what follows here is a brief description of his zones occurring in central Darfur.

Under 250 mms. annual rainfall: Acacia Desert Scrub.

This zone stretches southwards from the 50 mm. isohyet until/

until a line is reached at which grass growth is such that annual grass fires become a possibility. This line is roughly the 300 mm. isohyet.

The type species is Acacia raddiana, and with it occur Acacia tortilis, Acacia flava, Maerua crassifolia and Capparis decidua. Under favourable water conditions Acacia mellifera, A. senegal and Commiphora africana occur in this zone.

250 mms. to 500 mms.: Acacia Short Grass Zone.

This zone transects both sand country and areas of sedentary soils. In the former, the type species is Acacia senegal, while on the latter soils the type species is Acacia mellifera. Both occur in admixture with other species.

500 mms. to 1000 mms.: Acacia Tall Grass Savanna.

This is the type zone of the great clay plains, where often Acacia spp. are the sole arboreal vegetation. This phase does not occur in central Darfur. Here the soils are varied, grits and loams mainly, and the main species are Balanites aegyptiaca, Anogeissus schimperi, Albizzia sericocephala, Acacia spp., Combretum spp. and many others.

There are numerous works on vegetation classification from other territories in Africa. Those from the drier regions of West Africa have particular significance, as conditions there bear close resemblance to the conditions in Darfur.

Works by Aubreville, Dundas, and Fairbairn, are briefly summarised below.

Aubreville's 1936 paper on the forests of the Niger Colony gives a clear picture of the vegetal zones recognised and affirms a direct relationship between rainfall and vegetal type. Below the zones, however, he does not go on to/

to a consideration of associations, but merely deals with typical species found in that zone. That is, the zone is treated as one association. As none of his zones span a wide rainfall range, this assumption may well be correct. His zonal classification is given in the next chapter. Aubreville subdivides his zones into edaphic units before giving his species lists.

Dundas (1938) deals with the same territory, but in some respects in less detail than Aubreville. He does not make use of vegetal zones, but divides the vegetation into Formations, under which he recognises and describes various Associations. Some of these will be referred to later.

Dr. Fairbairn (1943) is another writer on the vegetation of the Niger Colony. His is a dual classification, recognising both zones, as Aubreville; and formations and associations. The division into formations is very full and thorough, and has been used by the writer as a model for his classification. In his later work on the Central Western Sudan and its Vegetation (1945), Dr. Fairbairn deals with both the Niger Colony and Northern Nigeria. The classification used in both papers is essentially similar.

Discrepancies exist between the associations recorded by Dundas and those of Fairbairn, for the same area. In this respect it should be noted that Dundas' report is based on a three months' visit to the Niger Colony, while Dr. Fairbairn's experience of the territory spans over a decade. In the chapter which follows, therefore, correlation of the present work will be attempted mainly with Dr. Fairbairn's work.

Works cited:

Smith, J. - "Distribution of Tree Species in Relation to Rainfall and Soil Texture"; Sudan Govt. Min. of Agric. Bull, 4, 1949.

Andrews, F.W. - "The Vegetation of the Sudan," chap. IV of Agriculture in the Sudan, ed. Tothill, London, 1948.

Aubreville, A. - "Les Forets de la Colonie du Niger"; Bull. Comm. d'Etud. Hist et Scien, de l'A.O.F., 19, 1936.

Dundas, J. - "Vegetation Types of the Colonie du Niger"; Imp. For. Inst. paper 15, 1938.

Fairbairn, W. A. - "Classification and Description of the Vegetation Types of the Niger Colony, French West Africa"; Imp. For. Insp. paper 23, 1943.

Fairbairn, W. A. - "The Central Western Sudan and its Vegetation"; D.Sc. thesis in Univ. of Edinburgh Library, 1945.

CHAPTER VII.

CLASSIFICATION of the VEGETATION of CENTRAL DARFUR; and an ATTEMPT at its CORRELATION with the VEGETATION of WEST AFRICA.

In the classification used in the present work, the primary division is into FORMATIONS, and is based on the characteristic life-form of the dominant constituents of the vegetation. A formation is defined by Tansley (1949) as a unit of vegetation formed by habitat and expressed by a distinctive life-form. Each formation is composed of one or more ASSOCIATIONS, each having a separate specific composition.

The classification adopted by the writer is given below:

Formation 1: Semi-Desert Scrub.

Transition between true desert and thornland. Characterised by very open poor quality vegetation (mean height 8' (2.4 M)).

(i) Maerua - Capparis Association.

Formation 2: Thorn Savanna.

Vegetation characterised by the dominance of thorn-bearing trees and shrubs. Typically open.

(A) On hard soils.

(i) Acacia mellifere, A. orfota-Boscia Scrub Association.

(ii) Acacia mellifera-Commiphora-Boscia Association.

(iii) Acacia mellifera-Commiphora-Acacia tortilis-A. orfota Association.

(iv) Albizzia-Acacia Association.

(B) On Sands.

(v) Acacia senegal-Balanites-Guiera Association.

Formation 3: Savanna Woodland.

Characterised by the presence among the dominants of non-thorny species of tree habit.

(A)/

(A) On Hard Soils.

(i) Anogeissus-Acacia seyal-Lannea-Albizzia Association (Anogeissus rain-shadow woodland).

(B) On Sands.

(ii) Acacia senegal-Combretum-Guiera-Lannea Association.

Riparian Vegetation.

Formation 4: Riparian Thornland.

Thorn bearing species, mainly of shrub habit, on riparian sites.

(i) Acacia mellifera-Boscia-Acacia orfata Association.

Formation 5: Riparian Thorn Forest.

Thorn bearing trees frequently forming closed or nearly closed canopy on riparian sites.

(i) Acacia albida-Acacia tortilis-Ziziphus mucronata Association.

Mountain Vegetation.

Physiographical climax vegetation developed above 6,000' altitude.

It will be seen that the main part of this classification involves the recognition of two main edaphic types, hard soils and sands. The former are mainly sedentary soils but include some volcanic soils and some compacted sands; the latter, as the name implies, are the continental sands of eastern Darfur.

Riparian sites constitute a third distinct edaphic type; in this case soil water is the causitive factor. Mountain vegetation is influenced more by physiographic than by edaphic factors.

Hard soils contribute the largest group of associations, and it is possible to correlate the formations with rainfall zones. For this group of soils, these are:-

Under (200-300) mms - Semi-Desert Scrub.
(100-300) mms. to (500-600) mms. - Thorn Savanna.
Over (500-600) mms. - Savanna Woodland.

The/

The figures in parenthesis indicate the limiting range of the boundaries. Owing to variations in the edaphic values of sites along the boundary, this does not take the form of a straight line coincident with an isohyet. For the purpose of inter-territorial comparison, the means of these boundary ranges may be taken. The mean boundaries by rainfall then become -

Under 250 mms. - Semi-Desert Scrub.
250 mms. to 550 mms. - Thorn Savanna.
Over 550 mms. - Woodland Savanna.

On the sands area, both Thorn Savanna and Woodland Savanna formations occur within the rainfall range, 250 mms. to 500 mms. Edaphic variations are the determining factors in the distribution of these two formations in this habitat.

Riparian formations occur throughout the area of hard soils, and are independent of regional climate. In general, they do not occur in the sands area as there is no run-off from this type of soil.

By defining the distribution of formations in terms of rainfall, it is possible to compare the classifications used in West Africa by different workers with those of the Sudan.

The table on the following page gives the zonations used for the vegetation of the Niger Colony as defined by the different workers in their papers, compared directly with those of Andrews (Sudan) and the writer (Darfur).

TABULAR REPRESENTATION of the VARIOUS VEGETAL ZONES RECOGNISED by DIFFERENT WORKERS.

From the great individual variations in zonal boundaries, it would appear that each worker (including the writer) has his own ideas as to what constitutes distinct zones or formations. Closer inspection reveals a tendency to identify the 200 mms. to 300 mms. isohyets with the transition from saharan or semi-desert conditions to thornland; and the 500 mms. to 600 mms. isohyets with the transition from thornland to savanna woodland. This latter boundary is more universally recognised than the former.

From the similarity of the climatic regimes in the Niger Colony and in the Sudan (see map at end of chapter), some such degree of correlation between the vegetation types of the two territories is to be expected. The map referred to has been prepared by the writer. The rainfall curves for West Africa are from Aubreville and are based on the records from 22 stations in the Niger Colony and Northern Nigeria. The Darfur end is from the writer's own map with data from 19 stations.

Going below Formation level, to Associations, the attempt to correlate West African and Darfur vegetation is not attended with success. None of the associations noted by either Fairbairn or Dundas can be recognised in Darfur. The writer opines that the reason for this is edaphic. From the descriptions given in the works cited, the commonest soil type in the Niger Colony seems to be much sandier than the general run of Darfur soils. The large tracts of sedentary soils, or sedentary soils overlain with thin superficial deposits of sand, now consolidated, which are a feature of Darfur, do not occur in the Niger Colony.

At most, all that can be said by way of correlation, is that the majority of species occurring in the Niger Colony, occur also in Darfur, under roughly similar climatic and edaphic conditions. The reverse, however, does not hold. The most constant species in all the associations of the

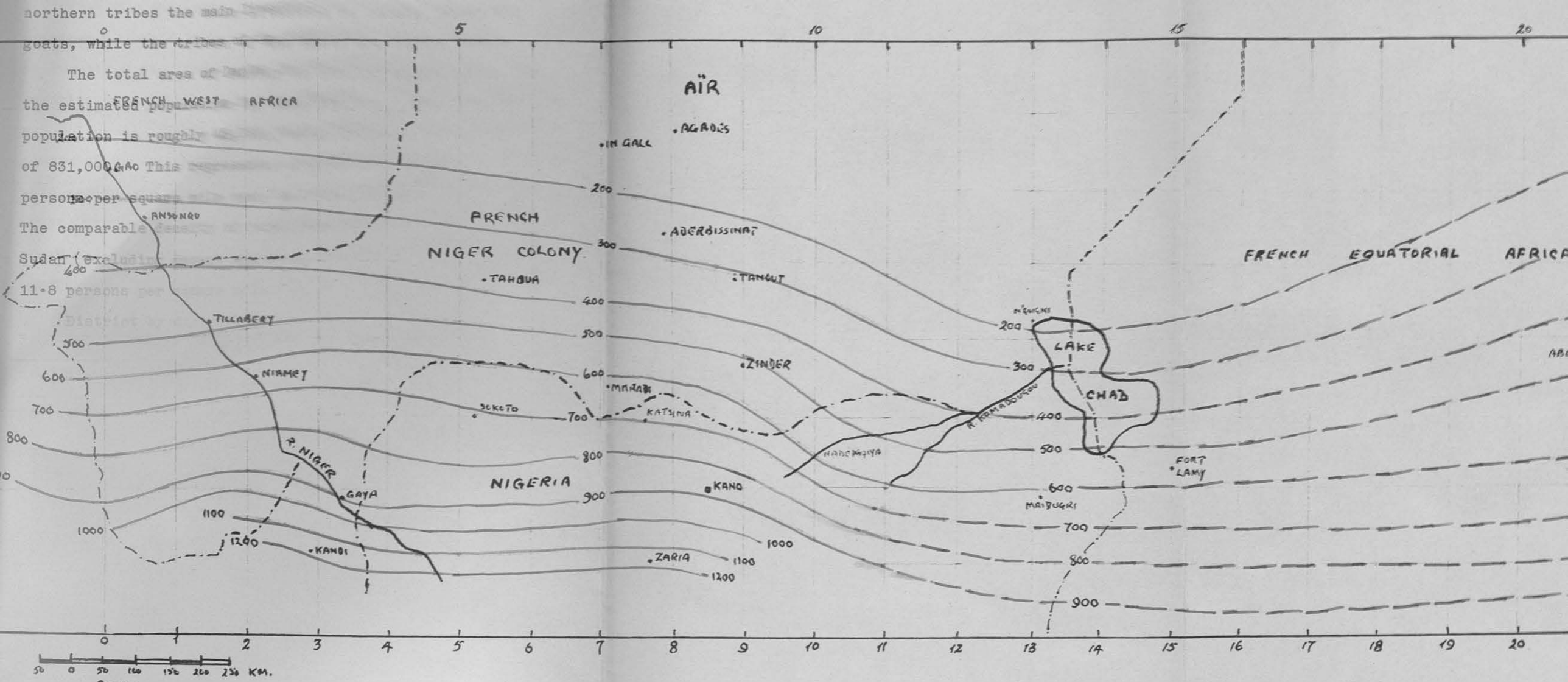
Thorn/

Thorn Savanna Formation in Darfur is Acacia mellifera. This is pre-eminently a species of hard soils; in the Niger Colony only Aubreville mentions it - in a minor role.

Apart from this exception, all the main species of Darfur are common to the Niger Colony, but owing to the different edaphic conditions, the proportions in which they are present at any given rainfall range, are not the same in the two territories. Such differences in proportionate representation make for different associations.

Works cited:

Tansley, A. G. "The British Islands and their Vegetation"; 2nd ed. Cambridge, 1949.


AÏR
FRENCH WEST AFRICA
FRENCH NIGER COLONY
NIGERIA
FRENCH EQUATORIAL AFRICA
LAKE CHAD
AGADES
IN GALL
ANSONGO
ABERDISSINAT
TANGUT
TAHOUA
ZINDER
TILLABERY
NIAMEY
SOKOTO
KATSINA
KANO
GAYA
KANDI
ZARIA
FORT LAMY
MAIDUGRI
N'GAOUNDERE
R. NIGER
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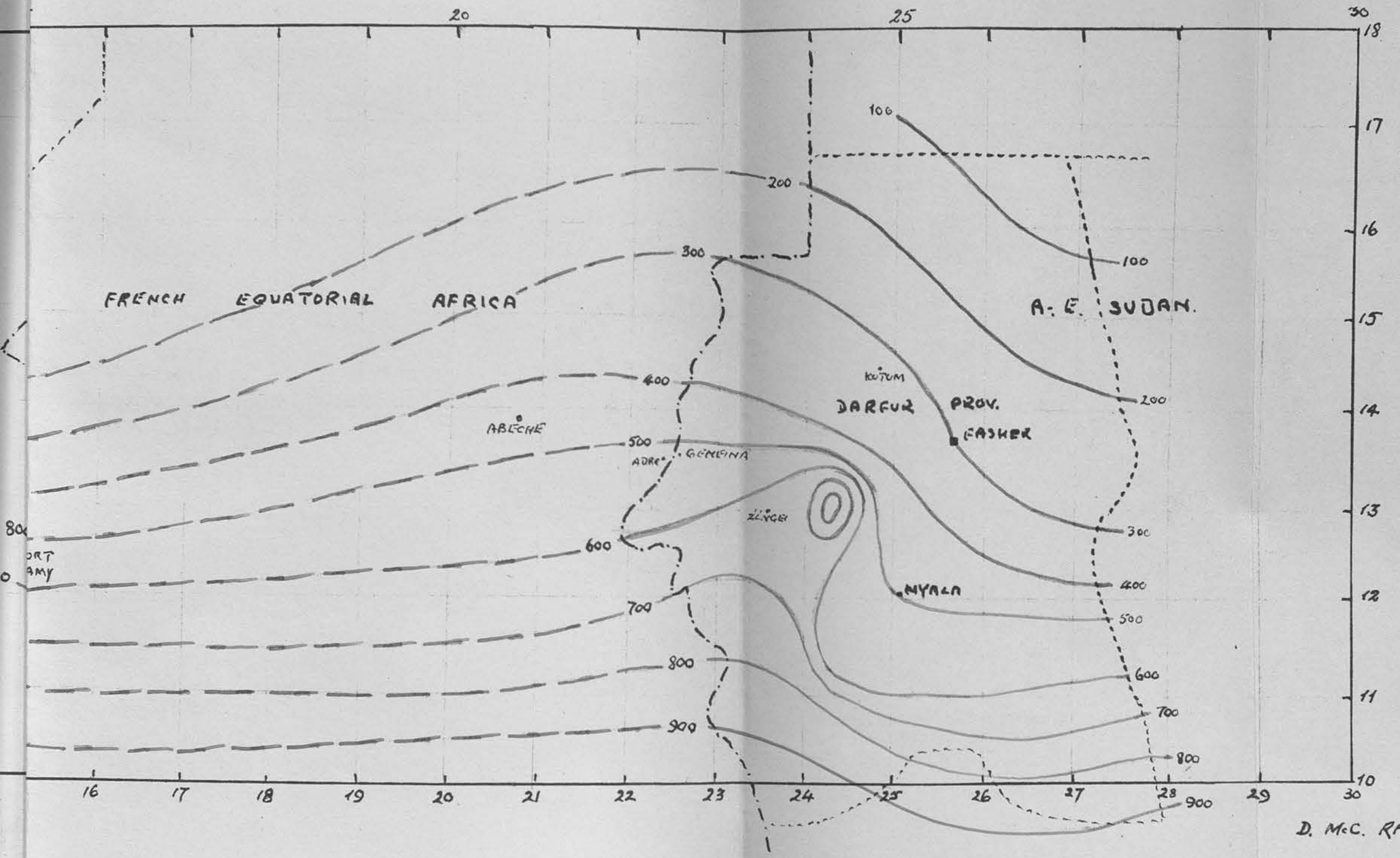


TRANS-AFRICA RAINFALL ISOHYETS.

400 ACTUAL ISOHYET.

400 PROJECTED ISOHYET.

D. McC. RAMSAY. 1952.

nearer the road.

From these records it is possible to determine what associations are present, and by transferring distances and occurrence to a map, to plot the boundaries of each association. This was the method employed in preparing the vegetation distribution map included in this paper.

The full set of running records covering central Darfur, is contained in Appendix 3.

The second stage in enumeration is the quantitative sampling of the vegetation. This was carried out by means of one acre enumeration plots. These were spaced 10 miles apart over most of the area. Latterly, greater distances apart were adopted where the uniformity of the association made this feasible.

Plots were laid out with chain and compass and were 220 yds. x 22 yds. in size (there are a very few ½ acre or smaller plots). Every woody species was recorded, and booking was by 2" diameter classes from 0" to 24", and one class of over 24". Trees of exactly the limiting diameter between two classes were recorded in the lower class. Trees falling on the lower and left hand boundary lines of the plot were included, these on the top and right hand boundaries were excluded from the enumeration.

Except for those plots specifically sited in cultivation regrowth, precautions were taken to see that plots were in undisturbed, uniform vegetation. This is not always easy. Diameter measurements were made with a biltmore stick, made by the writer to fit his own reach.

Full notes on the locality and site factors of each plot were made at the time of measurement, and also details of the height and canopy, and species in the grass and herb layer. Identifications were generally made by the writer. Doubtful or unknown species were referred to the Sylviculturist for identification in the Sudan Government Herbarium, or were/

were sent by him to Kew or elsewhere. Certain of the grasses were identified by the Pasture Research Officer, Sudan Veterinary Service.

From the quantitative data, represented by the enumeration plot figures, it is possible to determine the proportions of the different species in each association. The running records give the main constituents of each association and enable its boundaries to be plotted on the map. From this map the distribution of enumeration plots vis-a-vis associations can be seen at a glance. For each of the main species the numerical representation in all the plots of any association is tabulated. From this the proportionate representation (i.e. percentage of total stocking) of each main species of that association, and for that association, can be obtained. ('For that association' is inserted because several species occur in more than one association, but in each their proportionate representation is different).

Each of the main species does not necessarily occur in all the plots in an association, and by expressing the number of plots in which it is found as a percentage of the total number of plots in that association, the degree of distribution of the species throughout the association is obtained.

For each species in every association it is therefore possible to say, for example, that it makes up 20% of the total stocking of all species, and has been found on 90% of all the sites sampled.

To recapitulate: Qualitative sampling of the vegetation (running records) gives the main species present and enables associations to be recognised and their boundaries plotted. Quantitative sampling (enumeration plots) provides numerical data from which can be determined, for each species, in each association, the proportionate representation in terms of total stocking, and the distribution as a function of the total number of sites examined.

So/

So far as is known to the writer, this statistical approach to the presentation of stocking data, has not been used by other workers in this field. Commonly the terms abundant, frequent, occasional and rare are used to describe frequency of occurrence. Such terms are very useful (and are used in parts of the present work), but they are not functions of an absolute scale of values.

Of the field methods used by other workers, Aubreville and Dundas give no account of their methods. In the absence of specific details, it is assumed that the descriptions are based on notes (not necessarily continuous) on the vegetation made at the time of driving through it. Dr. Fairbairn made "running records", in one mile steps, of the vegetation and used these as a basis for his descriptions. These were supplemented by acre or larger enumeration plots, but the number of plots is not given, and the combined data from them is not worked up. The percentage stocking of each species for each plot is given, however.

CHAPTER IX.

ASSOCIATIONS on HARD SOILS.

(i) General.

This division comprises six associations, of three different formations. They are classed together here because of the overall similarity of the soil type. Variations in this do occur as will be noted in the individual descriptions, and these give rise to corresponding variations in the vegetation, but in the broad view, the main type is a compacted sedentary soil.

The different associations succeed one another from north to south, which is the direction of increasing rainfall. The boundaries of the associations are roughly comparable in shape with the rainfall isohyets, but do not follow them closely.

The inter-association boundaries are in general not distinct, and a transition zone of varying width is invariably present. The transition zone is characterised by a general intermixing of the species of both associations, or where several species are common to both by a gradual alteration in the proportion of each present.

The depth of transition zone varies from 400 yards to 2 miles measured at right angles to the long axes of the associations. They can be discerned in the running records but frequently show a width greater than 2 miles since the roads do not necessarily cross association boundaries at right angles.

Typically, transitions from one formation to another are more sharp than between associations in the same formation. Apart from this characteristic, inter-formation boundaries are similar in structure to inter-association boundaries.

It/

It may be argued that the first three associations of the thorn savanna formation can be classed together as one association, by virtue of the number of constant species (Tansley: species common to all three). The writer holds that this is not strictly correct, since the degree of stocking of each species is not constant throughout the three communities. This distinction between occurrence and degree of occurrence, is used to segregate the constant species into main species and subsidiary species for the purpose of recognising and naming the associations.

(ii) Semi-desert Scrub Formation.

Maerua - Capparis Association.

This is the most northerly association recorded in this study of Darfur, and is the only one falling in the semi-desert scrub formation. It occurs north of lat. 15° 30' N, in an area of old stabilised sand dunes, receiving less than 300 mms. of rain per year. The arboreal vegetation is very open and is composed of scattered stunted bushes in a sea of grass. Only one enumeration plot was sampled in this association and it gave a stocking of 18 bushes per acre of two species only. The stocking data from this one plot is -

Maerua crassifolia 83% and

Capparis decidua 17%

The maximum height is 12' (3.6 M) and the average 5' (1.5 M). From the vegetation running record other species present in small quantity are:

Boscia senegalensis,

Leptadenia spartium,

Acacia tortilis,

Balanites aegyptiaca,

and Acacia mellifera.

Boscia and Leptadenia occur on the compacted sand in admixture with the two type species. The three latter species, however, occur in shallow depressions and hollows - sites of water onflow. In addition Acacia mellifera colonises the sides and flat-tops of inselbergs of Nubian sandstone which protrude above general plain level.

Grass is abundant in the area and gives approximately 80% ground cover. The commonest grass is Cenchrus biflorus with wicked barbed fruits. Aristida plumosa and the tussock-desert-grass Panicum turgidum also occur, but nowhere rival the abundance of Cenchrus. The aromatic tumble-herb Geigeria alata occurs in some abundance in hollows and depressions.

Apart from grazing this zone is of no importance in the economy of the province. The rainfall is low, and, more important, too uncertain for agriculture. In a year of average rain, however, the area provides plentiful coarse grazing: Cenchrus, in the young stage before the fruit spines become hard, is eaten by cattle, while camels find it palatable at all stages in its development. This area is therefore the grazing ground of the northern Zaghawa camels.

In relation to that 'cause celebre' of the 1930's, the advancing Sahara, this area is of great interest. The writer has made only one short trip in this formation, but he noticed no signs of sand advancement or instability. The arboreal vegetation is too sparse to have any widespread sand binding action; this function is performed by the dense grass growth already noted. Verbal evidence from others who have travelled deeper into this formation confirms this statement, and gives the boundary between semi-desert and true-desert in Darfur as roughly the Wadi Howar.

(iii) Thorn Savanna Formation.

Acacia mellifera - Acacia orfota - Boscia Scrub Association.

This is the most northerly association of the thorn savanna formation. It occurs as a belt some 30 miles deep from north to south, and it covers the rainfall range of 300 mms. to 350 mms. in the west to 200 mms. to 250 mms. in the east. This rainfall range covers the association occurrence as plotted on the map only. The extension eastwards of this belt probably covers the rainfall range 150 mms. to 200 mms. It occurs on sites having a thin, gravelly, sedentary soil, sometimes overlain with compacted drift sand.

Six enumeration plots were recorded in this association, and the stocking and distribution data from them in respect of seven main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia mellifera	24.8	83
Acacia orfota	18.0	67
Boscia senegalensis	25.2	100
Acacia tortilis	11.3	50
Capparis decidua	6.4	67
Maerua crassifolia	12.8	50
Commiphora africana	1.5	33

The stocking of the above main species is 44 per acre and they constitute 91.5% of all the species enumerated.

In addition to the above, the vegetation running records show Balanites aegyptiaca as an occasional member of the association and Ziziphus spina-christi as locally occasional.

The average stocking of all species is 48 per acre. With the exception of Balanites and Acacia tortilis, all the species are shrubs or small stunted trees, and most of them are thorn bearing. The maximum height attained is 20'/

20' (6 M) in the case of emergants of Balanites and Acacia tortilis, but the average height is much less, 8.1' (2.4 M) only.

In general ground cover is very poor and the canopy open, although thicket-stage-closure obtains locally where several bushes grow close together and their branches intertwine.

There is no understorey as such of shrubs. The grass and herb layer is poor in species, and thin in cover. The main grasses belong to the genus Aristida, among which A. adscensionis, A. funiculata, and A. plumosa are found to be common. Eragrostis gangetica, Ctenium elegans and Cymbopogon proximus are found locally. The herb Geigeria alata is also found, usually on sites with a sand overlie, along with the grass Cenchrus biflorus.

From a forestry viewpoint, this association is of no value. Cultivation on a small scale is practised, but this is a precarious occupation as the rains are uncertain both in spacing and in total amount. The grazing is also poor.

(iv). Acacia mellifera - Commiphora - Boscia Association.

This is the second association recognised in the thorn savanna formation. It occurs as a belt stretching right across the province from west to east, but is of no great depth from north to south. In the north the boundary is contiguous with that of the preceeding association. In the west the association is at its deepest north to south, about 50 miles, and the southern boundary is at approximately the 400 mm. isohyet. The boundary does not, however, follow the isohyet, but crosses ENE to cut the Kutum-Umm Buru road just north of Dor, in the region of the/

the 300 mm. isohyet, then goes SE to east of Kutum, then due east to north of Mellit, then ESE to Khereit and Abyad and north of Umm Kedada. At this point the association is some 15 miles deep from north to south, and the south boundary is approximately the 225 mms. isohyet.

From this skewed distribution in relation to the rainfall isohyets, it will be surmised that edaphic conditions are not uniform throughout the zone. This is the case. In the south-west, the soil is typically a sandy-clay, usually of no great depth, overlying Nubian sandstone, or more commonly basement complex measures which are in great part not the parent materials of the soil. In the centre and east the soil is a typical sedentary grit; thin, compacted and stony with little or no profile development.

There are 12 enumeration plots in this association, and the stocking and distribution data from these in respect of nine main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia mellifera	30.9	92
Commiphora africana	22.8	75
Boscia senegalensis	19.3	92
Acacia senegal	8.8	25
Acacia orfota	7.1	23
Acacia tortilis	6.3	50
Balanites aegyptiaca	2.1	50
Capparis decidua	1.5	17
Albizzia sericocephala	1.2	17

The stocking of the above species is 61 per acre and they constitute 95% of all the species enumerated.

Other species occurring in this association as evidenced by the running records are:

Maerua crassifolia, occasional (about the same numerical strength as Capparis or Albizzia).

Dichrostachys glomerata, rare.

Dalbergia melanoxylon, rare.

Ziziphus/

Ziziphus spina-christi, rare.

Acacia seyal, very rare.

The Acacia senegal is not evenly distributed throughout the association, but occurs in greatest numbers on the sandier sites in the south-west. This species is, of course, primarily one of sands rather than of hard soils. Locally, in areas of deeper or more unconsolidated sand, Acacia senegal takes the place of A. mellifera in the association. Such areas are small compared to the total area of the association, and in general the two species occur together on sandy sites.

The stocking in the association is low, 64 trees and shrubs of all species per acre. The canopy is generally open, although thicket closure of the two main species takes place over limited small areas. The maximum height recorded is 20' (6 M) (Balanites) and individual Commiphora reach 16' to 18' (4.8 to 5.4 M). The average height of the association is 10.6' (3.2 M).

There is no shrub layer as such composed of species other than those listed above. The grass and herb layer is slightly richer in species than that of the preceeding association. Again, the most abundant genus is Aristida, then in order of decreasing occurrence come Cenchrus biflorus (locally abundant on sandy sites in the west, with Acacia senegal), Eragrostis tremula and E. gangetica, Cymbopogon proximus (locally common on harder soils), Dinebra retroflexa and Panicum turgidum. The herb Geigeria alata is frequently found, and Blepharis edulis occurs on the sandier sites.

From a forestry view-point there is little of importance in this association. Local firewood supplies for some of the northern villages are cut from it, but no evidence of over cutting was found. The distribution by size classes of the species in the enumeration plots shows that/

that there is a sufficiently strong young age class present to provide replacements for all that is cut out.

From Tundubai to Kulbus, wherever sufficiently light soils occur, shifting cultivation may be carried out. In general the practice is not widespread, and no signs of land degradation through over cultivation were seen. Abandoned cultivation sites are colonised by Acacia senegal, Ziziphus spina-christi, Geigeria alata and Blepharis in the first year. As the Acacia grows bigger, the herbs and Ziziphus are ousted and their places taken by Commiphora and other species of the original association. After 10 to 15 years' regrowth it is hardly possible, botanically, to distinguish an abandoned cultivation site from virgin association. The difference in size and height continues for a long period after this, of course.

(v) Acacia mellifera - Commiphora - Acacia orfota - Acacia tortilis Association.

This may be considered the main association of the thorn savanna formation. It occurs over a large area and on a wide range of soils.

The northern boundary marches in the west and central areas with the preceeding zone, then from Mellit follows the western edge of the main sands area through Tawilla to Mosku, then Nyala. The southern boundary is approximately the 450 mms. isohyet from north of Geneina, grading into the 500 mms. isohyet round the north end of Jebel Marra and steeply SSE to Nyala. Thus the rainfall range over the association is 400 mms. to 450 mms. in the west, 300 mms. to 500 mms. in the centre, and 400 mms. to 500 mms. in the east. It is probable that this association can be viewed as the climatic climax vegetation of the Thorn Savanna formation./

formation.

The soils vary from a sandy-clay in the west (of the same type and mode of formation as noted in this region of the preceeding association); a volcanic loam in the hilly tract to the north of Jebel Marra in the central zone; and a hard compact gritty sedentary soil in the north-central and eastern regions. This sedentary soil is derived mainly from basement complex granites and metamorphic rocks.

There are 34 enumeration plots in this association, and the data summarising the stocking and distribution of eleven main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia mellifera	35.8	94
Commiphora africana	12.7	68
Acacia orfota	11.8	68
Acacia tortilis	10.1	79
Acacia senegal	9.9	62
Boscia senegalensis	6.8	50
Albizzia sericocephala	4.2	44
Balanites aegyptiaca	2.8	53
Capparis decidua	2.0	50
Acacia seyal	2.0	26
Acacia adansonii	1.8	21

The average stocking of the above species is 85 per acre and they comprise 75% of all the species enumerated.

In addition to them, scrutiny of the enumeration plot sheets and running records discloses the occurrence of the following species (all of which occur less frequently than Acacia adansonii).

Maerua crassifolia, locally occasional to rare.

Ziziphus spina-christi, occasional to rare, (typically found in regrowth on abandoned cultivations).

Adansonia digitata, occasional (notably in the SE area - i.e. north of Nyala).

Dalbergia melanoxylon, occasional to rare.

Sclerocarya birrea, rare.

Hyphaene/

Hyphaene thebaica, local, rare.

Bauhinia rufescens, rare.

Lannea humilis, local, rare.

Euphorbia candelabrum, local, rare, confined to volcanic soils of hilly terrain.

The stocking of all species is 114 per acre. This figure, which is much higher than either of the two preceeding associations in this formation, is due to the presence of a definite shrub layer, the species of which were enumerated along with the main crop in the plots.

The shrub layer comprises the following species, against each of which is given an estimate of its frequency. This estimate is based on the number of occurrences in enumeration plots.

Grewia tenax, frequent.

Cadaba farinosa, frequent.

Cordia crenata, frequent.

Grewia villosa, occasional.

Cissus quadrangulus (liane) occasional.

Capparis tomentosa, occasional.

Combretum aculeatum, occasional.

Albizzia anthelmintica, occasional.

Cadaba glandulosa, rare.

Calatropis procera, rare.

Maerua angolensis, rare.

Cordia ovalis, rare.

Boscia senegalensis, although counted as a main species, is in reality a member of the shrub layer.

Despite the increased stocking per acre, the canopy is still open, although the local areas of thicket closure are both individually larger and occur more often than in the preceeding associations. The maximum height growth recorded is 26' (7.8 M). The average height of the main crop is 14' to 15' (4.2 to 4.5 M), and that of the shrub layer 4' to 5'/

5' (1.2 to 1.5 M).

Grass growth is variable, being sparse on sedentary soils and increasing in abundance on sandy-clays and volcanic loams. The principal genus is still Aristida which is found (enumeration plot data) on 87% of all the sites sampled. The main grasses and their relative frequency are listed below.

Aristida spp., abundant (mainly A. adscensionis and A. stipoides).

Cenchrus biflorus and C. prieurii, frequent (on light and volcanic soils).

Eragrostis tremula, occasional locally frequent.

Aristida pallida, occasional.

Chloris spp. (mainly C. pilosa) occasional.

Dinebra retroflexa, occasional.

Schmidtia pappophoroides, occasional.

Eragrostis gangetica, rare, locally occasional.

Echinochloa colona, rare.

Aristida plumosa, rare.

Tribulis terrestris, rare (only found on well-watered loams).

Schoenfeldia gracilis, rare.

From a forestry and land-use view-point, this association is fairly important. In or near to it lie most of the main towns and villages of central Darfur. The trees and bushes are cut for firewood and small building poles, and areas of suitable soils (the lighter soils, never sedentary soils) are cleared for cultivation. Grazing by cattle, sheep and goats is widespread, starting around the centres of population after the rains and working outwards as the nearby grass is grazed off.

Forest, or rather bush and grass fires are not unknown, but deliberate and systematic annual burning is not practised.

Around/

Around the towns and larger villages the perimeter for a varying distance out has been cut-over for fuel requirements. In the course of time a very depleted relict association of useless weed species (including tree weeds, such as Capparis decidua and Acacia orfota) is all that can, and is, allowed to grow. This is being combated in the case of the more populous centres by creating (under an Order by the local Native Administration) a circular perimeter of so many miles radius in which it is forbidden to cut any vegetation whatever. In the case of Nyala, population 6,000, the prohibited area is a circle of 7 miles radius from the centre of the town. Mounted forest guards patrol this area to ensure the Order is observed, and bring offenders before the town bench. In effect this keeps cutting off the small circle on the very doorstep of the town, and spreads it over a wider circle further out. A further step would be to divide the perimeter outside a certain inner zone into blocks, say six blocks, each to be open to cutting for, say, 3 years, and closed for 15 years to allow regeneration.

(vi) Albizzia - Acacia seyal - Acacia senegal - Acacia mellifera Association.

This is the highest association of the thorn savanna formation. From its geographical position it might be thought that it would be a transition community between thorn savanna and woodland savanna. Botanically, the species have more affinities to thorn savanna. For example, out of 12 main species in this association, 11 of them are found in the preceeding association of thorn savanna, while only 7 of them occur in the 12 main species of/

of the succeeding Anogeissus woodland association.

The association occurs in two separate areas, a western variant and a south-eastern variant. The boundaries of the western area are in the north from 35 miles north of Geneina ESE to a point to the north of the main Marra massif, while the southern boundary runs from 30 miles south of Geneina ENE to the same point on the west side of the Marra range. The shape is that of a skewed acute-angled triangle lying on its side. The rainfall range is in the west from 450 mms. in the north, to 550 mms. in the south, changing to 500 mms. and 600 mms. respectively as the apex is approached.

The south eastern area starts from a point on the east side of the central mountain range, and the west boundary skirts the east edge of the massif and passes south through Kalokitting and west of Kas, while the east boundary, starting from the same point on the massif goes south-east to Kidingir and Nyala. The west boundary follows very closely the 600 mms. isohyet, while the east boundary follows the 500 mms. isohyet.

When considered together, the two areas of this association cover the area included between the 450 mms. to 500 mms. isohyets on the dryward edge, and the 550 mms. to 600 mms. isohyets on the wetward edge. The whole may, therefore, be considered one climatic zone, and the vegetation as primarily a climatic association.

The two variants of the association will first be described separately, and their essential similarity demonstrated. The two will then be combined and the result described in detail.

In the western variant, the overall soil type is a sandy-clay overlying basement complex and Nubian sandstone measures. Areas of consolidated sand and sedentary soils and volcanic loams also occur locally.

There/

There are ten enumeration plots in this variant and the data regarding the stocking proportion and distribution of twelve main species is given in the table below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia senegal	34.6	90
Acacia mellifera	20.4	70
Acacia seyal	14.2	70
Albizzia sericocephala	12.0	100
Boscia senegalensis	5.2	40
Acacia orfota	3.0	30
Acacia tortilis	2.6	30
Commiphora africana	2.6	10
Balanites aegyptiaca	2.5	50
Acacia adansonii	2.4	50
Capparis decidua	0.4	20
Dalbergia melanoxylon	-	-

The average stocking of the above species is 100 per acre, and they form 81% of all the species enumerated.

In the south-eastern variant, the overall soil type is basically a sedentary, gritty clay, the surface of which is subject to water erosion. This gives rise to gradual soil denudation over part of the surface and deposition of part of the transported material on adjacent sites at a lower level. On non-draining receiving sites (hollows and depressions) this gives rise to a surface clay pan. Generally, these depressions are shallow and the clay pans are superficial. Consequently, they do not carry a vegetation distinct from the surrounding vegetation. Where the physical features are such that a deep and usually extensive clay pan can build up, this so alters the site conditions that a specialised vegetation is developed. Such sites are treated in Chapter II on Riparian Formations.

The above process is going on in all areas of sedentary soil, but it is only in this association that the rainfall is sufficient to make the process marked to the naked eye.

There/

There are 13 enumeration plots in the south-eastern variant of the association, and the stocking and distribution data in respect of the same twelve main species as were recognised in the western variant is given hereunder.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia mellifera	18.9	77
Acacia senegal	17.3	85
Albizzia sericocephala	15.8	92
Acacia seyal	10.6	77
Acacia orfota	10.4	69
Balanites aegyptiaca	8.2	69
Acacia tortilis	8.0	69
Dalbergia melanoxylon	4.2	31
Commiphora africana	3.0	15
Acacia adansonii	2.2	8
Capparis decidua	1.1	31
Boscia senegalensis	0.2	8

The average stocking of the above main species is 92 per acre, and they comprise 82% of all the species enumerated.

A tabular comparison of the data from these two variants is given below.

	Percentage of total stocking for each species.		Percentage of plots in which each species found.	
	W	SE	W	SE
Albizzia sericocephala	12.0	15.8	100	92
Acacia senegal	34.6	17.3	90	85
Acacia mellifera	20.4	18.9	70	77
Acacia seyal	14.2	10.6	70	77
Four main species total %age.	81.2	62.6		
Acacia orfota	3.0	10.4	30	69
Acacia tortilis	2.6	8.0	30	69
Balanites aegyptiaca	2.5	8.2	50	69
Boscia senegalensis	5.2	0.2	40	8
Commiphora africana	2.6	3.0	10	15
Acacia adansonii	2.4	2.2	50	8
Capparis decidua	0.4	1.1	20	31
Dalbergia melanoxylon	-	4.2	-	31

From/

From this comparison it can be said that the two variants are sufficiently close to be basically of the same association. Of the four type species, leave out for the moment Acacia senegal, the remaining three account for 46.6% of the total stocking in the western variant, and 45.3% in the south-east variant. A. senegal alone shows a significantly higher stocking in the west than in the south-east. The reason for this is edaphic. The tree is predominantly (although not exclusively) a sand species and finds the lighter, sandier clays of the west more to its liking than the compacted sedentary clay grits of the south-east.

From this tabular comparison, it is possible to divide the species into three classes according to site preference.

1. Those preferring sandy sites -

   Acacia senegal.

   Boscia senegalensis.

2. Those preferring hard-soils sites, -

   Acacia orfota.

   Acacia tortilis.

   Balanites aegyptiaca

   Capparis decidua

   Dalbergia melanoxylon

3. Those equally at home on sands and on hard-soils -

   Albizzia sericocephala.

   Acacia mellifera.

   Acacia seyal.

   Commiphora africana.

   Acacia adansonii.

It should be noted that this classification holds only for the rainfall range 450 mms. to 600 mms.

Combination of the basic numerical data for the twelve main species from both variants (i.e. 23 plots) gives the following stocking and distribution figures.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Albizzia sericocephala	14.1	96
Acacia senegal	24.9	87
Acacia mellifera	19.5	74
Acacia seyal	12.4	74
Acacia orfota	7.1	52
Balanites aegyptiaca	5.7	61
Acacia tortilis	5.6	52
Commiphora africana	2.8	13
Acacia adansonii	2.3	26
Boscia senegalensis	2.4	22
Capparis decidua	0.8	26
Dalbergia melanoxylon	2.4	17

The average stocking of the above species is 98 per acre, and they constitute 82% of all the species enumerated.

Examination of the enumeration sheets and running records discloses the occurrence of the following species. Against each is indicated the frequency of occurrence, and the soil type preferred.

Ziziphus spina-christi - occasional, on both sandy and hard soils.

* Bauhinia rufescens - rare, on both sandy and hard soils.

Combretum cordofanum - occasional. Only on sandy soils.

* Adansonia digitata - locally occasional to rare. Only on hard soils.

Lannea humilis - rare. Mainly hard soils.

Sclerocarya birrea - rare. Mainly hard soils.

* Hyphaene thebaica - rare. Hard soils.

* Anogeissus schimperi - rare. Hard soils.

* Bauhinia reticulata - rare. Hard soils.

The species marked * are normal constituents of riparian associations in this area. Their occurrence noted here/

here is away from riparian sites.

The stocking of all species is 120 per acre, and the proportion of tree species to shrub species is higher than in the preceeding associations. The maximum height is from 25' to 35' (7.5 to 10.5 M) (emergants of one of the tree species) and the average height of the main crop is around 16' (4.8 M) and the shrub layer 5' (1.5 M).

The shrub layer comprises the following species -

Grewia tenax - locally abundant.

Combretum aculeatum - locally abundant.

Grewia villosa - frequent.

Cadaba farinosa - frequent.

Cordia crenata - frequent.

Capparis tomentosa - frequent.

Albizzia anthelmintica - occasional.

Dichrostachys glomerata - occasional.

Cassia senna - occasional.

Again, Boscia senegalensis, although counted as a main species, is in fact a member of the shrub layer.

Canopy overall is open, although there is an increasing tendency to larger and larger patches of thicket closure. A heartening feature of this association is the number of times it is recorded in the enumeration notes that "Stocking is particularly good in the younger age classes." A probable explanation of this is suggested in the land-use notes on this association.

Grass growth is variable, being dense where the canopy is open, and sparse or non-existent under areas of thicket stage bush. The commonest genus is Aristida (mainly A. adscensionis, A. funiculata, and A. plumosa) with Cenchrus making a strong appearance on the sandier sites. Other common grasses are - Eragrostis spp. and Dinebra retroflexa. The grasses Cymbopogon proximus, Cynodon dactylon and Echinochloa colona are found locally on/

on special sites.

From a forestry and land-use view, this association is of some importance. In it occurs the main eastern extension of the Gum Arabic belt (Acacia senegal). Tapping of the trees is not systematically carried out, except in the near vicinity of markets. This area, particularly the western area, is so far from the main gum markets that only a very low price can be paid in the local market to the producer. This does not encourage tappers to go far afield. Rather does it lead to the tapping of young immature trees as well as middle-aged stock near to the markets.

Cultivation is carried on throughout the zone on the lighter soils. This is also a fairly important area for grazing, rather from its geographical position than from the quality of the pasture. The main cattle-owning Baggara tribes to the south drive their herds north during the rains to escape the mud and flies. While most of these herds go north-east on to the sands area, some congregate round Geneina, Kas and Nyala, and other towns in this association.

Little evidence was seen of grass burning. For the past two decades, vigorous propaganda has been undertaken by the administration against promiscuous grass firing. This has included fines and imprisonment for those found guilty. The present absence of widespread burning is a direct result of this policy. This is also the probable cause of this association having the high stocking in the young age classes already noted. This phenomenon was noted in both variants and the absence of firing is the only logical reason to which it can be ascribed.

The four type species are all well represented in the young growth. The species having the highest number is Acacia senegal, followed fairly closely by Acacia mellifera, and/

and Acacia seyal and Albizzia about equal sharing last place. These young classes are all in excess of what is required to provide normal recuitment to the older classes at their present level of stocking.

If this process continues unchecked, it will undoubtedly result in a thickening-up of the vegetation, thereby giving greater protection to the soil. In course of time this will result in more favourable soil conditions, and may also allow colonisation by more demanding species, enriching the present association or creating a new one.

While that is pure conjecture, it can be stated now that this is the first association so far examined which shows signs of advancing, not geographically, but ecologically.

(vii) Savanna Woodland Formation.

Anogeissus - Acacia seyal - Lannea - Albizzia Association.

This is the only woodland association on hard soils found in central Darfur. It is a climatic association and occurs in the rain shadow of Jebel Marra, that is, stretching south-west from the central massif. The dry-ward boundary is essentially the 600 mms. isohyet throughout its length, except in the extreme west, where it is 550 mms. Rainfall up to 800 mms. per annum, and over, is recorded from the zone. The altitudinal limit of the association is approximately 6000', above which mountain vegetation is found. Thus the central ridge of Jebel Marra, over 6000', is outside the association, although within the rain-shadow.

The soils vary from rich brown loams of volcanic origin in a matrix of rotting rock (typically basaltic lavas)/

lavas), to gritty sedentary soils formed from either basement complex granites and metamorphic rocks, or Nubian sandstone measures. The first type is found in the vicinity of the central mountain range, and is confined to the north-east part of the association. Its distribution follows closely the ancient lava flows. The sedentary soils are found away from the volcanic region. They are typically poor soils, similar to the general run of sedentary soils found elsewhere in the province.

There are 24 enumeration plots in Anogeissus woodland, and the stocking and distribution data concerning twelve main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Anogeissus schimperi	31.3	71
Acacia seyal	17.4	79
Lannea humilis	15.0	75
Albizzia sericocephala	9.7	92
Acacia senegal	6.7	42
Boswellia papyrifera	5.0	25
Balanites aegyptiaca	4.5	58
Commiphora africana	4.4	58
Dalbergia melanoxylon	3.1	33
Acacia adansonii	1.4	29
Sclerocarya birrea	0.9	29
Acacia hebecladoides	0.5	25

The average stocking of the above main species is 90 per acre, and they form 82.5% of all the species enumerated.

Running records of the vegetation show the occurrence of the following species. An attempt has been made to indicate the site preference of each species, e.g., 'Sed' indicates it is more usually found on sedentary soils, and 'Volc' performs the same function for volcanic soil sites. 'Both' indicates found on both soil types in equal quantity. An * before the name indicates this species is normally found in riparian vegetation. These entries, however, apply to its occurrence outside riparian conditions. The more important species are given first.

Khaya/

* Khaya senegalensis (volc.) - rare.

* Cordia abyssinica (volc.) - occasional to rare.

Prosopis africana (volc.) - rare.

* Acacia campylacantha (volc.) - rare.

* Acacia sieberiana (volc.) - rare.

* Ficus sycomorus (volc.) - rare.

Combretum elliotii (volc.) - rare.

Combretum cordofanum (sed.) - rare.

Terminalia macroptera (volc.) - rare.

Ziziphus spina-christi (both) - occasional.

Sterculia setigera (sed.) - rare.

* Bauhinia rufescens (both) - rare, locally occasional.

* Bauhinia reticulata (volc.) - rare.

Guiera senegalensis (sandy sed.) - rare.

Acacia tortilis (sed.) - rare.

Acacia orfota (sed.) - rare.

Acacia mellifera (sed.) - rare.

From this list it will be seen that the important secondary species tend to occur exclusively on volcanic soils. This is only natural, since such soils are intrinsically richer than sedentary grits, and also from their geographical position receive a higher rainfall. Thus it is possible to distinguish edaphic variations over the association with regard to the secondary species, but the main species show a more or less uniform distribution over the whole association irrespective of soil type.

The maximum height recorded in the association is 35' (10.5 M), and the average over the main crop is 20' (6 M).

There is usually a shrub layer present - average height to 5' (1.5 M) - and its degree of development is inversely proportionate to the degree of canopy closure. In the following list of shrub species, the abbreviations used are the same as those used in the list of secondary tree/

tree species.

Grewia tenax (both) - occasional, locally frequent.

Thespesia garkiana (volc.) - frequent, locally abundant.

Combretum aculeatum (mainly sed.) - occasional.

Dichrostachys glomerata (both) - rare.

Cordia crenata (both) - rare.

Cadaba glandulosa (mainly sed.) - occasional.

Cadaba farinosa (sed.) - rare.

Boscia senegalensis (sed.) - rare.

Cissus quadrangulus (both) - rare.

The stocking of all species, including shrub layer is 109 per acre. The canopy over the main part of the association is open. Locally, particularly in the area of volcanic soil, stocking is dense enough to produce a closed canopy. Under this condition, both the shrub and grass layers are much reduced. This is particularly so under small areas of Anogeissus consociation, which tend to have an almost clean forest floor.

In the grass layer, the commonest genus is again Aristida. This is closely followed by Eragrostis tremula sp. and Chloris spp., and these three are the main genera. Other species include Cymbopogon proximus, Schmidtia pappophoroides, Schoenfeldia gracilis and Aristida plumosa, while Echinochloa colona and Pennisetum ochrops occur on well watered sites. The grasses Andropogon gayanus and Hyparrhenia pseudocymbaria are dominant over wide areas of the volcanic soil region. These grow to a height of 5' to 8' (1.5 to 2.4 M) in comparison with the other species normal maximum of 3' to 4' (about 1 M).

This zone is important to the forester. In it lie most of the 'wadis' which sites and their fringing riparian vegetation/

vegetation are so important in the economy of the province. Riparian sites and vegetation are described in Chapter XI, but for their continued existence, the surrounding Anogeissus woodland must be maintained. In the 1952/53 dry season it was noticed by the writer that grass burning in this association was much more widespread than hitherto. Normally, the incidence of burning is not severe, and the fires that do occur are almost invariably the result of carelessness. Most of the main species will stand the occasional grass fire without suffering permanent damage, but continual late-burning will kill off the more fire-tender species and damage the soil. The widespread burning this past year has been caused by illegal Fellata graziers. These people, the Umm Bororo, have been infiltrating into Darfur from French Equatorial Africa for some time now, and have been settling down among their kinsmen, the Darfur Fellata, in southern district. Their presence in ever-increasing numbers caused administrative difficulties, and overstocking of both people and cattle. An attempt was therefore made in early 1952 to return the Umm Bororo to French territory. Many escaped this unpopular move, or returned again after it, and have been living an illegal "free-lance" existence, usually keeping on the move and finding grazing for their herds where they can. The local Fur of this zone are cultivators more than stock-owners, hence most of the Anogeissus woodland grazing is unused. The Umm Bororo were quick to seize this fact, and have been pasturing their herds there in the 1952/53 dry season. Being newcomers, they have not been subjected to the continuous propaganda against burning, and, anyway, this is not their own homestead. So it is common to burn the countryside when a herd passes on to a fresh area. Another reason may be that burning over the perennial Hyparrhenia and Andropogon induces fresh shooting from the rootstock, which, to cattle, is a luxury in the late dry season/

season when everything is parched.

The burning, however, will ultimately result in degradation of the vegetation if allowed to go on unchecked. Other than the complete expulsion of the Umm Bororo, the only solution lies in the introduction of early burning of the grass (i.e., firing as soon in the dry season as it will burn). This would be a retrograde step, but is much less harmful than promiscuous middle or late burning.

Cultivation is carried on by the local Fur, who are industrious cultivators, on areas of suitable soil. In this association such sites are largely confined to the volcanic loams. Contour terracing is a necessary preliminary to cultivation on the volcanic hill slopes, and from the evidence of abandoned terraces, now reverted to natural vegetation, cultivation was much more widespread in the past than it is now. On abandoned cultivations, the first colonisers are the shrubs Grewia tenax and Dichrostachys glomerata, sometimes with Ziziphus spina-christi. Soon, an impenetrable thorn tangle is formed, up to 6' (1.8 M) high, in the shelter of which the tree species return. The type species Anogeissus schimperi is one of the first and strongest to make a return, and as it gains hold and emerges through the shrub tangle, the latter are gradually killed off. Ziziphus and Dichrostachys are the first to go, but Grewia may persist unless, and until, the overwood closes canopy. It is difficult to put times to these various seral stages; the following is an estimate based on numerous observations. Colonisation by shrubs starts the first year after abandonment. The shrub thicket stage is reached in 5 to 7 years. Tree seedlings appear from years 5 to 10. The trees overtop the shrub layer by 12 to 15 years after abandonment. Die-back of shrub layer commences from about year 20 onwards. By age 40 to 50 years it is practically impossible to distinguish secondary regrowth from the untouched association.

(viii) Ecological Order of Species Occurring on Hard Soils.

In Appendix 4 will be found the numerical data concerning the stocking of the main species in each association. Consideration of this data should enable the ecological order of the species to be determined, (i.e., in order of ascending site requirements).

Each species is not confined to one association, but will be found in several. Each species, however, has what may be termed its optimum association or associations. This is the association in which its numerical representation is greatest. Associations lower in the scale will have progressively diminished representation of this species since the general level of site values is progressively lower. Similarly, associations higher up the scale than the optimum will also have progressively diminishing representation of that species, since it will be ousted by more demanding species better suited to the site.

In the same way, considering all the species found in any one association, all of them are not of the same ecological status. There will be a small representation of species whose optimum sites are of lower value than the association under review. Greatest representation will be from those species whose optimum sites approach that of the association, and there will be an ever diminishing representation of species whose optimum sites are progressively higher than that of the association.

If the species are arranged in correct ascending or descending order, then for any association the stocking figures will start low, progressively rise to a maximum, and then progressively diminish as the other end of the species scale is approached. Similarly, if all the associations are arranged in ascending or descending ecological order, the distribution of any one species through the different associations will be of the same nature./

nature.

By combining all the species and all the associations in the one table, a theoretically perfect distribution would be as represented below.

Ascending Ecological Order of Associations →

Ascending Ecological Order of species. ↓

	Assn. I	Assn. II	Assn. III	Assn. IV	Assn. V	Assn. VI
Species 1	B	A				
Species 2	A	B	A			
Species 3	A	B	C	B	A	
Species 4		A	B	C	B	
Species 5			A	B	C	A
Species 6			A	B	C	B
Species 7				A	B	C
Species 8				A	B	B
Species 9					A	B
Species 10					A	A

A, B and C represent the % stocking of the species.
C is greater than B, which in turn is greater than A.

In the table of actual data which follows, it is assumed that the order of ascending ecological status of the associations, is the order in which they occur from north to south on the area.

Once this order is fixed, it is a matter of trial and error adjusting the order of the species until the data distribution gives the nearest approach to the theoretical ideal. The figures used in this table are the % stocking of each species for each association.

ECOLOGICAL ORDER of SPECIES and ASSOCIATIONS on HARD SOILS.

Formation	Semi-Desert Scrub.	Thorn Savanna.				Woodland Savanna.	
Association / Species	Maerua-Capparis Association.	A. mellifera-A. orfota-Boscia Scrub Association.	A. mellifera-Commiphora-Boscia Association.	A. mellifera-Commiphora-A. tortilis-A. orfota Association.	Acacia-Albizzia Association.	Anogeissus Woodland Association.	
	% stocking each species	% stocking each species	% stocking each species	% stocking each species	% stocking each species	% stocking each species	
Maerua crassifolia	83.0	12.8					
Capparis decidua	17.0	6.4	1.5	2.0	0.8		
Boscia senegalensis		25.2	19.3	6.8	2.4		
Acacia tortilis		11.3	6.3	10.1	5.6		
Acacia orfota		18.0	7.1	11.8	7.1		
Acacia mellifera		24.8	30.9	35.5	19.5		
Commiphora africana		1.5	28.8	12.7	2.8	4.4	
Acacia senegal			8.8	9.9	24.9	6.7	
Balanites aegyptiaca			2.1	2.8	5.7	4.5	
Albizzia sericocephala			1.2	4.2	14.1	9.7	
Acacia seyal				2.0	12.4	17.4	
Acacia adansonii				1.8	2.3	1.4	
Dalbergia melanoxylon					2.4	3.1	
Anogeissus schimperi						31.3	
Lannea humilis						15.0	
Boswellia papyrifera						5.0	
Sclerocarva birrea						0.9	
Acacia hebecladoides						0.5	

Species arranged downwards in order of increasing ecological status.

Associations in order of increasing ecological status. →

The order of the species in this table is the best approach to the theoretical ideal which the collected data will give. Discrepancies from the ideal are due certainly in part to edaphic variations across some associations, (e.g. sand) favouring certain species at the expense of others. For example, in the Acacia-Albizzia Association, the presence of lighter soils seems to have increased the stocking of Acacia senegal at the expense of Balanites and Commiphora. Also, certain species are shown to have a wide range of tolerance in their dominant habitat. Acacia mellifera is a good example, and the figures for this species tend to confuse the general picture.

It is interesting to compare the order of the Acacias with that given by Smith (1949). Dealing with datum clays, (i.e., clays which receive no more water than their rainfall, and lose none of it by run-off), situated mainly in the eastern Sudan, he gives the sequence of species in ascending ecological order as:

* Acacia flava
A. orfota
A. raddiana
A. tortilis
A. mellifera
* A. fistula
A. senegal
A. seyal
* A. drepanolobium
** A. campylacantha
** A. sieberiana
** A. albida
A. hebecladoides
* A. seyal var multijuga
* A. abyssinica.

Note:- The species marked * do not occur in Central Darfur./

Darfur.

Species marked ** are found commonly only on riparian sites and will be dealt with in Chapter XI.

Worked cited:

Smith, J. (1949) - "Distribution of Tree Species in the Sudan in Relation to Rainfall and Soil Texture" (Part II, Chap. 2, A, (i).) Khartoum.

CHAPTER X.

ASSOCIATIONS on SAND.

(i) General.

The boundaries of this vast area of drift sand which covers the whole of the eastern part of central Darfur, are, in the north a line Mellit - Khereit - Abyad - Umm Kedada - Dam Gamad, and on the west a line Mellit - Tawilla - Mosku - Nyala.

The superficial geology of the area is composed of an overlie of wind-deposited sand derived from the breakdown of Nubian sandstone rocks in the Libyan desert to the north and transported by the prevailing dry-season wind (a N to NE wind). This sand was deposited in two (or more) separate invasions. It is generally possible to distinguish the sands of the two invasions by reason of the sands of the later invasion (generally referred to as the second invasion) being as yet unconsolidated and the particles largely unsorted; while the earlier (first) invasion sands show a certain redistribution of the clay and silt particles caused by water action. If we assume that the two invasions took place in the last and second last (or earlier) dry periods (see Chapter II: Geology), then the rainfall of the intervening pluvial period, or periods, would probably account for the redistribution of fine particles in the earlier deposition. Under present-day rainfall, redistribution of particles in the second invasion sands is going on, but has not reached the stage of development demonstrated in the earlier sands.

The composition of the vegetation on the sands shows a striking change from that to the immediate west. The boundary between sands and sedentary soils is abrupt, and it forms a barrier which several heretofore common species

cannot/

cannot cross. The same cannot be said of the transition between associations within the sands area; this is characterised by a general intermingling of species over a deep front, from one to five, or more, miles across.

From the habit of the vegetation, two Formations can be recognised. The first is Thorn Savanna, in which most of the species are thorn-bearing, and have a bush habit. The second is Savanna Woodland, in which a good proportion of the species are trees. There is only one association in each formation.

(ii) Thorn Savanna on Sand.

Acacia senegal - Guiera - Balanites Association.

The boundaries of this association are in the north and west; those of the sands area, namely, north: Mellit - Khereit - Abyad - Umm Kedada, and west: Mellit - Tawilla - Mosku - Nyala. The eastern boundary is approximately Umm Kedada - Wada'a - Mahugeria. The rainfall increases from 250 mm. in the north to nearly 500 mm. in the south. The soil is sand of the first invasion.

There are 17 enumeration plots in this association, and the stocking and distribution data for nine main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia senegal	28.2	82
Guiera senegalensis	17.1	41
Balanites aegyptiaca	15.7	71
Boscia senegalensis	14.2	53
Ziziphus spina-christi	7.0	41
Acacia orfota	6.5	30
Acacia tortilis	5.8	35
Maerua crassifolia	3.8	12
Combretum cordofanum	1.6	12

The average stocking of the above nine species is 44 per/

per acre and they form 70% of the total crop. The following subsidiary species were noted -

Boscia salicifolia - occasional to rare.

Acacia albida - occasional on cultivation sites.

Leptadenia spartium - rare.

Adansonia digitata - rare.

Acacia mellifera, Acacia adansonii, Acacia seyal, Albizzia sericocephala - rare. All found under special site conditions at 500 mm. rainfall.

The total stocking of all species, including shrub layer, is 63 per acre. The following species were noted in the shrub layer:

Combretum aculeatum - frequent.

Cadaba farinosa - frequent.

Grewia tenax - frequent.

Cadaba glandulosa - occasional.

Dichrostachys glomerata - occasional.

Grewia flavescens - rare.

Albizzia anthelmintica - rare.

Calatropis procera - rare. Cultivation regrowth.

The canopy is open and growth is generally sparse. Exceptions to this are local patches of Acacia senegal which attain thicket closure. These are usually even aged stands of cultivation regrowth. The maximum height recorded from the association is 26' (7.8 M). This height is for emergants, usually Balanites or large Acacia senegal. The average height of the main crop is 14' to 15' (4.2 to 4.5 M) and of the shrub layer 5' (1.5 M).

The herb and grass layer is particularly rich in species and dense in growth. The commonest grasses are:

Cenchrus biflorus

Aristida spp.

and Eragrostis tremula, all of which are abundant.

Other/

Other species are:

Schoenfeldia gracilis - frequent.

Chloris spp. - frequent.

Setaria verticillata - occasional.

Cymbopogon proximus - occasional.

Dactylatenium aegyptium - rare.

Schmidtia pappophoroides - rare.

Species of Aristida present, include -

A. stipoides,

A. funiculata,

and A. pallida.

Cenchrus prieurii is present in small quantity with C. biflorus. The two common Chloris spp. are C. pilosa and C. prieurii.

Among the herbs, the commonest is Blepharis linariifolia.

The importance of this association, from the forestry and land-use points of view, will be discussed along with that of the next association, since the conditions of importance are the same in both cases.

(iii) Savanna Woodland on Sand.

Acacia senegal - Combretum - Guiera - Lannea Association.

The boundaries of this association are approximately these of the second invasion sands. That is, from Dam Gamad on the Kordofan - Darfur boundary westwards to Umm Kedada, then south-west to Wada'a, and finally due south to Mahugeria. South of the central zone, as taken for this paper, the association boundary goes south-east from Mahugeria to Daien and Abu Gabra. The soil is a deep, loose/

loose sand, and the whole central area is a single, vast sand dune, the Ma'alia 'qoz'. The qoz is oriented with its long axis in the direction of the prevailing wind, i.e., north to south. The line of the central axis is Umm Kedada - Taweisha - Heskanita, and along this line the depth of sand is greatest, averaging over 100 feet.

There are 15 enumeration plots in this association, and the data from these regarding the stocking and distribution of eleven main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia senegal	23.0	93
Combretum cordofanum	19.8	100
Guiera senegalensis	17.3	93
Lannea humilis	11.6	40
Boscia senegalensis	8.4	67
Balanites aegyptiaca	7.2	60
Commiphora africana	6.8	27
Maerua crassifolia	3.6	53
Sclerocarya birrea	1.0	40
Terminalia macroptera	1.0	27
Stereospermum kunthianum	0.3	13

The average stocking of these main species, which form 92% of the total crop, is 62 per acre.

Subsidiary species noted from the running records are:

Dalbergia melanoxylon - occasional, locally frequent.

Prosopis africana - local. Occasional to frequent.

Bauhinia rufescens - occasional.

B. reticulata - occasional.

Adansonia digitata - occasional.

Boscia salicifolia - occasional to rare.

Albizzia sericocephala - rare.

Tamarindus indica - rare.

Acacia seyal - rare.

A. orfota - rare.

A. tortilis - rare.

Boswellia papyrifera - very rare.

The/

The shrub layer on the whole is poorly developed. It comprises the following species:

Combretum aculeatum - frequent.

Grewia tenax - frequent.

G. villosa - frequent.

Albizzia anthelmintica - occasional.

Cadaba glandulosa - rare.

Randia nilotica - very rare.

Ziziphus spina-christi.

Calatropis procera.

The last two species are generally found as transient components of cultivation regrowth, and have no permanent place in the association.

The average stocking of all species is 67 per acre. The canopy is invariably open, and none of the species (except to a limited extent Guiera) have any tendency to form local consociations of thicket. Maximum height growth recorded is 30' (9 M) and the average height of the tree crop is 18' to 20' (5.4 to 6 M). The shrub layer averages 6' (1.8 M) in height.

The grass and herb layer is well developed and comprises the following species: Aristida spp. abundant (including A. pallida, frequent; and A. stipoides and A. hordacea, occasional). Cenchrus spp. abundant (mainly C. biflorus with some C. prieurii and C. ciliaris).

Eragrostis spp. - frequent.

Schoenfeldia gracilis - occasional, and

Schmidtia pappophoroides - occasional.

The only herb noted in any abundance is Blepharis linariifolia.

This association, and the preceeding association of thorn savanna on sand, are of great importance to forestry and land use. This importance is through the preponderance of Acacia senegal, - the producer of the true gum arabic/

arabic in the vegetation. Taking both associations together, this species accounts for 25% of the total stocking. Agriculture is widely practised in both associations. It will have been noted throughout these descriptions that the lighter soils are preferred for agriculture. Such soils are usually intrinsically poorer than loams and semi-clays, but are much easier to work, hence the preference for them. The limiting factor in the expansion of cultivation in this area has been the lack of water supplies. The Adansonia digitata noted in the vegetation lists, invariably has been introduced by man. The soil around each tree or group of trees is compacted into a depression and puddled with silt and clay. The boles of the trees are hollowed-out. Rain water collects in the depression and is immediately scooped-up and stored in the hollow trunk of the tree. This age-old method of water conservation is still practised, but the ever-increasing network of mechanically pumped deep-bores (drawing their supplies from Nubian sandstone and other measures at about 450' to 500' depth), is enabling an increasing population to stay on the sands cultivating and keeping livestock.

The growth and tapping of Acacia senegal, and cultivation of field crops, alternate in time on the same area of land, in what is known as the "Gum-Cultivation Cycle". This has been developed to perfection in the more densely populated Kordofan province, but can be seen in a modified form on the sands of eastern Darfur. The cycle starts with an area of thorn savanna on sand which is cleared and the land cultivated for a period of up to 6 years. It is then allowed to revert to tree species. Acacia senegal is the most vigorous of the colonisers, and within 2 years there is usually a good crop of young gum trees on the ground. On average sites this crop reaches 6' (1.9 M) in height at 4 years old, and on well stocked sites will run to/

to over 50 trees per acre. Tapping for gum generally commences when the trees are 4 or 5 years old and continues annually. Maximum yield is obtained at 9 years of age, at which time the trees are on the average 13' (4 M) high. Decline in the yield now sets in, and by 12 years old the trees are generally considered finished. They are then 13' to 16' (4 to 5 M) high.

Under the intensive system practised in Kordofan, the land is now cleared and put under field crops for a further period of 4 to 6 years. The actual length of the cycle depends on the population pressure on the land. The general ideal is 4 years cultivation followed by 12 years gum. With increasing pressure this is modified to 6 years cultivation and 12 years gum. A final stage is reached when with even greater pressure the gum tends to be dropped from the cycle and continuous food cropping practised.

On the sands of eastern Darfur the population is not sufficiently dense to develop the Gum-Cultivation Cycle to its optimum. The following variations may be practised. Cultivation may be carried on for up to 10 years. Consequent upon this, regeneration of A. senegal takes longer to become established after abandonment. Up to 6 years may be required before tapping is commenced. The useful tapping life of the tree is constant at about 8 to 10 years, but in Darfur when the tree has passed this age it may be allowed to stand for a few more years until the cultivator returns to that area to clear it again.

There are a number of features concerning the sylviculture of Acacia senegal, and the Gum Cultivation cycle which are not yet fully understood. One fact, however, is known which is assumed to have a direct bearing on the cycle. That is the fact that A. senegal possesses root nodules, and it is assumed that it is through nitrogen fixation that the cycle can persist apparently in perpetuity. The

nitrogen/

nitrogen removed by the field crops is returned in kind to the soil during the phase in which A. senegal occupies the land.

(iv) Species Distribution and Zonation in the Sands Area.

While the conception of the two formations found on sand being each a separate and recognisable association is, in the overall view, correct, it should be noted that within each association the distribution of species is not regular throughout. Covering as they do the rainfall span of from 250 mms. to 500 mms., this is not to be wondered at, and yet the variations in the view of the writer are not sufficient to justify their recognition as separate associations.

In the Thorn Savanna formation, at the south end of its range, (450 mms. and over), a catenary sequence of soils and vegetation is discernible. This formation is found on the sands of the earlier invasion, one of the characteristics of which, as already noted, is the re-distribution of silt and clay content through water action. This phenomena becomes more marked as the rainfall increases, and by the 500 mms. isohyet, three gradations in soil texture from dune crest to hollow are recognisable.

In describing these the writer has found it necessary to use an Arabic word, "Nagaa", which may be defined as a soil with a firm and usually smooth surface. The site gradations are:

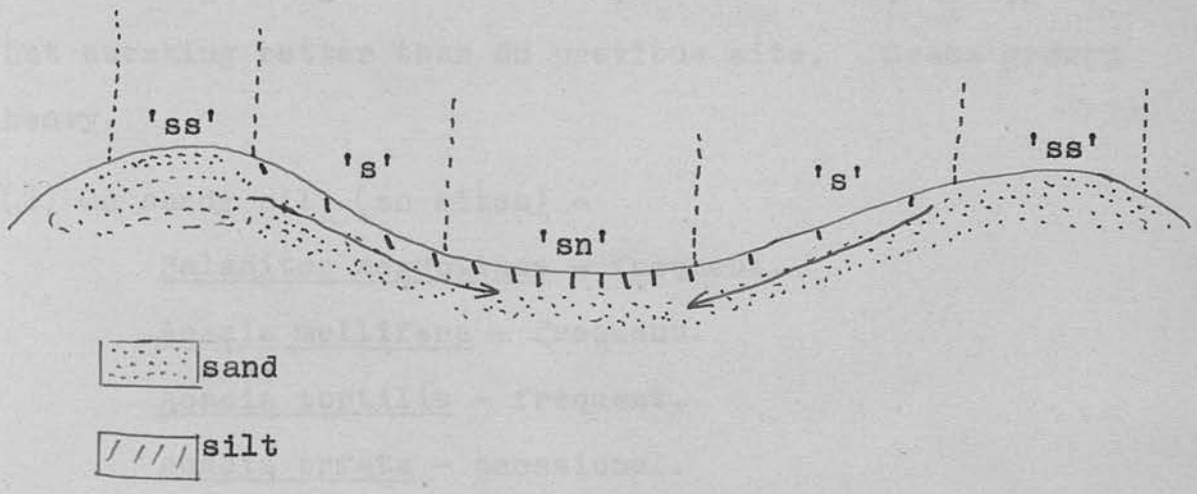
(1) 'ss' (soft sand) Found along the dune crest. Light yellow in colour.

(2) 's' (sand) On the sidelong slopes. More compacted than on the crest, and having a higher silt content. Reddish-yellow/

yellow to light-brown in colour.

(3) 'sn' (sandy-nagaa) A sandy silt. Sufficient silt and clay content to make the whole compact and firm. Mid-brown to gray in colour.

Each one of these soil types is a unit in a vegetation-soil catena. Diagramatically, the catena may be represented thus:



Arrows indicate direction of increasing silt and clay particle content.

The main components of the vegetation found on each of these sites is:

(1) On deep, loose sand (ss sites) -

Guiera senegalensis - abundant.
Combretum cordofanum - frequent.
Balanites aegyptiaca - frequent.
Acacia senegal - occasional.
Combretum aculeatum - occasional.
Albizzia sericocephala - rare.
Boscia senegalensis - rare.

Average height 20' (6 M), canopy very open with moderately heavy grass under.

(2) On compact sands (s sites) -

Acacia senegal - frequent.
Albizzia sericocephala - frequent
Balanites/

Balanites aegyptiaca - frequent.

Combretum aculeatum - frequent.

Guiera senegalensis - occasional.

Combretum cordofanum - occasional.

Ziziphus spina-christi - occasional.

Boscia senegalensis - occasional.

Acacia adansonii - occasional.

Acacia tortilis - occasional.

Average height 15' to 18' (4.5 to 5.4 M), canopy open, but stocking better than on previous site. Grass growth heavy.

(3) On sandy silt (sn sites) -

Balanites aegyptiaca - frequent.

Acacia mellifera - frequent.

Acacia tortilis - frequent.

Acacia orfata - occasional.

Acacia seyal - occasional.

Capparis decidua - occasional.

Acacia senegal - rare.

Ziziphus spina-christi - rare, locally occasional.

Height averages 12' (3.6 M) with Balanites to 18' (5.4 M). Canopy open and stocking poor. Grass growth moderate.

Exceptionally a further site type ('n' or nagaa) may be developed in an enclosed catchment area. This is a deep, impermeable cracking clay. Such sites are small in number and area, and carry a riparian thornland vegetation. They are described in the following chapter on riparian vegetation, and are merely mentioned here in passing as they form, in some cases, the last phase of the catena described above.

The catena is described in detail as it is the only real example of one observed in central Darfur. It is caused by the redistribution of the silt and clay content in/

in a sandy soil. It is probable that under the rainfalls obtaining in this region, a sand is the only parent soil type which would give rise to a catena.

In the savanna woodland on sand occurring on the deeper sands of the Ma'alia qoz an apparent zonation of certain species can be discerned. In the map immediately following the main constituents of the vegetation with their frequency of occurrence along stretches of the roads, have been inserted in their correct geographical position. This data has been taken from the running records of the vegetation.

It will be noticed that certain species tend to occur in zones, but that these zones do not run parallel with the isohyets as might be expected. The lines of maximum occurrence of three species, Sclerocarya birrea, Lannea humilis and Terminalia macroptera have been drawn on the map. These may be called the zonal axes of the species.

From their shape it is apparent that some factor in addition to the rainfall is concerned. This other factor must be connected with the soil. In the absence of systematic soil sampling and analysis, it is impossible to give proof, but theorising leads the writer to the conclusion that soil texture is the probable controlling factor.

First, it must be assumed that when originally deposited, the Ma'alia qoz was homogeneous. So far as is known, it was all deposited in the one period, by one agency, wind, and was derived from one parent material, Nubian sandstone, so this assumption is probably correct. If it is accepted, it rules out sudden changes in the composition of the sand as the cause.

So/

EASTERN DARFUR SANDS.

SPECIES FREQUENCY LINES

Sclerocarya birrea
Lannea humilis
Terminalia macroptera

ABBREVIATIONS USED—

Ab. — Abundant.
Fr. — Frequent.
Occ. — Occassional.
loc. — locally.

Scale 1/1,000,000.

26 27

14 13 12

Khuweit.

Abyad

Umm Kadada

Scler. birrea Ab.
Guiera seneq. Fr.
Maerua crass. Fr.
Lannea hum. Occ.

Prov. Bdy. DARFUR KORDOFAN

Dam Gamad

Scler. birrea Ab.
Acacia seneq. Ab
Maerua cress. Ab.
Guiera seneq. loc. Fr.
Lannea hum. Fr./Occ.

Wada'a

Umm Hosh.
Acacia seneq. Ab.
Guiera seneq. Ab.
Combrtm. cord. Fr.
Maerua crass. Fr.
Scler. birrea Fr.
Lannea hum. Fr.

Gabir

Acacia seneq. Ab.
Guiera seneq. Ab.
Combrtm. cord Ab.
Lannea hum Ab.

Acacia seneq. Ab.
Guiera seneq. Ab.
Combrtm. cord. Ab.
Lannea hum. loc. Fr.

Umm Kutkut Scler. birrea Occ.
Terminalia mac. Occ

Acacia seneq. Ab.
Guiera seneq. Fr.
Combrtm. cord. Occ.

Acacia seneq Ab.
Guiera seneq. Ab.
Combrtm cord. Ab
Lannea hum. Fr.
Scler birrea Occ.

Taweisha

Combrtm. cord. Ab.
Terminalia macrp. Ab.
Acacia seneq. Fr.
Guiera seneq Fr.
Scler. birrea Fr.
Stereosp. kunth Fr.
Lannea hum. occ.

Ghabeish

Beringil

Umm Sauna

Combr. cord Ab.
Termin. mac. Ab.
Acacia seneq. Fr.
Guiera seneq Fr.
Stereosp kunth. Fr.
Scler. birrea Occ.

Heskanita

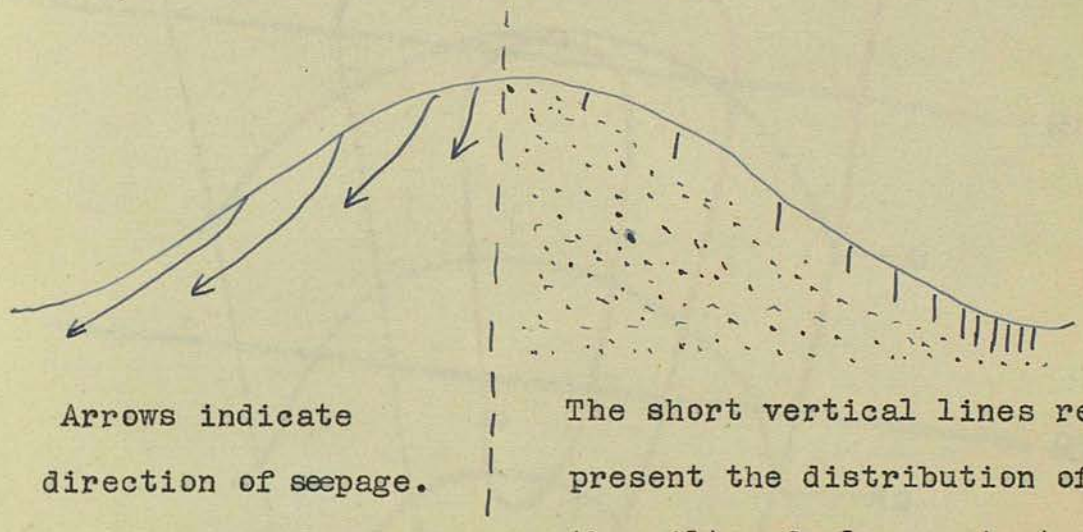
Mahugeriya

Acacia seneq. Ab.
Guiera seneq. Ab.
Scler. birrea Fr.
Combrtm. cord Fr.
Dalbergia melanox. Fr.
Lannea humilis Occ.
Terminalia mac. Occ.
Stereosp. kunth. Occ.

Acacia seneq. Ab.
Combrtm. cord. Ab.
Guiera seneq. Ab.
Scler. birr Fr. INCR. →
Termin. mac. Fr. ← INCR.
Stereosp. kunth. Fr. → Occ.

D. McC. Ramsay, 1953.

So far as we are aware, the only externally applied factor to which this homogeneous dune has been subjected, is rain. Even light rain over a sufficiently long period would cause a certain redistribution of part of the silt and clay content. It is assumed that water percolation down the sidelong slope of the dune has, in the course of time, increased the fine particle content of the sand along the lower contours, at the expense of the higher contours. In cross section this is:



Arrows indicate direction of seepage.

The short vertical lines represent the distribution of the silt and clay content.

If this is the case, then, on Smith's theory of distribution with regard to rainfall and soil texture (1949), for any given rainfall there is more water available to the plant growing on the crest of the dune than there is to one growing at the foot. Intermediate positions have intermediate amounts available. Taking into account the rainfall and the soil texture, lines of equal water availability will trace a path similar to that shown on the diagram overleaf.

This theoretical path is very similar in shape to that of the zonal axes of the species plotted from observations of their frequency.

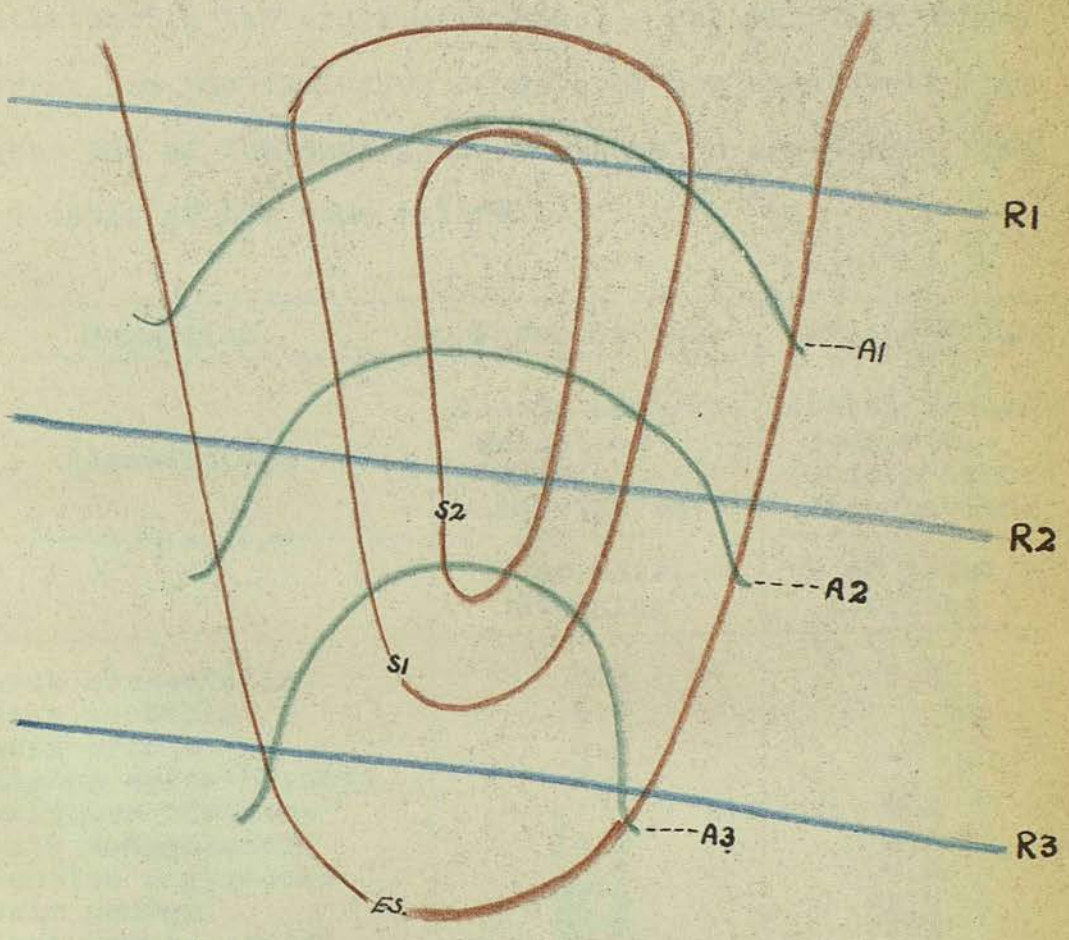
(v) Ecological Order of Species Occurring on Sand.

Sand presents entirely different edaphic conditions

from/

DIAGRAMATIC REPRESENTATION OF A THREE-PART SYSTEM : COMPRISING

1- SAND TEXTURE
2- RAINFALL
3- SPECIES DISTRIBUTION.



KEY TO SYMBOLS

CONTOURS OF SAND INVASION : ES- EDGE
S1
S2 RISING CONTOURS.

RAINFALL ISOHYETS : R1 LOWEST TO R3 HIGHEST.

AXES OF FREQUENCY BELTS OF SUCCESSIVE SPECIES, A1 TO A3 IN ORDER OF INCREASING ECOLOGICAL STATUS.

[EACH AXIS IS A LINE OF EQUAL WATER AVAILABILITY TAKING INTO ACCOUNT THE RAINFALL AND SOIL TEXTURE.]

D. McC. R.
1953.

from the so-called hard soils. In general, for the same rainfall, sands carry an ecologically higher vegetation than corresponding hard soil sites. Several species common (and one dominant) on hard soils are unable to cross the sands boundary, or do so only in much reduced strength. Thus, certain species of the hard soils will be missing from the sands list and there will be minor variations in the order of others. The main difference, however, is the inclusion of several new species at the higher end of the ecological scale which are absent from hard soils of the same rainfall.

Formation	Thorn Savanna	Savanna W/land
Associations	Acacia senegal-Balanites-Guiera Association.	Acacia senegal-Combretum-Guiera-Lannea Association.
	% of total stocking	% of total stocking
Maerua crassifolia	3.8	3.6
Acacia tortilis	5.8	
Acacia orfota	6.5	
Ziziphus spina-christi	7.0	
Commiphora africana		6.8
Boscia senegalensis	14.2	8.4
Balanites aegyptiaca	15.7	7.2
Acacia senegal	28.2	23.0
Guiera senegalensis	17.1	17.3
Combretum cordofanum	1.6	19.8
Sclerocarya birrea		1.0
Lannea humilis		11.6
Terminalia macroptera		1.0
Stereospermum kunthianum		0.3

Increasing status

Increasing status

The absence of Acacia mellifera from the sands is probably due to the morphology of its root system. It has a wide-spreading but shallow root system, whereas to succeed on sands, a deep tap-root system is necessary.

In the table, the positions of Sclerocarya and Lannea have been reversed from that suggested by the data. This has been done on the evidence of the distribution/

distribution as gained from the running records and quoted in the preceeding section. The poverty of numerical data regarding Sclerocarya is due to the fact that the enumeration plots in the run Umm Kedada to Heskanita go from the 300 mm. isohyet at Umm Hosh southwards, while from the evidence of the running records the main belt of Sclerocarya occurs between Umm Kedada and Umm Hosh.

CHAPTER XI.

RIPARIAN VEGETATION.

(i) General.

Under this heading is classed all the vegetation occurring on sites receiving more water than the bare rainfall. Typically, these sites are the banks and flood plains of seasonally flowing watercourses (wadis).

On the basis of the dominant habit, two formations are recognised. They are Riparian Thornland which corresponds to Thorn Savanna and in which the characteristic life form is the bush, and Riparian Thorn Forest corresponding to Woodland Savanna, but generally denser, in which the dominant life form is the tree.

The soil in both formations is water transported alluvium, mid-brown to almost black in colour, and of varying silt and clay content. Field observations show that the riparian thornland formation tends to occur on the heavier soils which are situated in or near the terminal delta of the watercourses, while thorn forest is more common on the banks and lateral flood plains of the wadis, such sites having a sandy-silt soil. These two soil types are distinguished in Arabic; the term "Naga'a", a hard silt or clay plain being used for the former, and "Tartura" which is a sandy silt for the latter.

All the zones have wadis flowing through them, with the exception of the sands area which absorbs all the rainfall and has therefore no run-off. The type of vegetation developed on riparian sites is remarkably uniform, as to species and habit, and it is independent of, and not influenced by, the vegetation of the zone in which it is situated. The factors controlling the nature of the vegetation are the number and duration of wadi flushes per year,/

year, and the texture of the soil.

The width of the individual occurrences varies tremendously. Often it is only a few yards wide along the actual bank of a small water channel, and goes up to several miles across in the case of the larger wadis with wide flood plains. There is usually no transition zone between riparian vegetation and the "country association" through which the wadi flows. Typically, the boundary is abrupt, as is to be expected when an edaphic association meets an essentially climatic association.

Each formation comprises one association. The descriptions follow.

(ii) Riparian Thornland Formation.

Acacia mellifera - Boscia - Acacia orfota - Balanites Association.

There are 16 enumeration plots in this association and the stocking and distribution data in respect of 11 main species is tabulated below.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia mellifera	40.7	94
Boscia senegalensis	13.4	56
Acacia orfota	13.0	69
Balanites aegyptiaca	9.9	75
Capparis decidua	6.5	50
Acacia tortilis	5.8	69
Ziziphus spina-christi	3.2	38
Acacia seyal	3.2	31
Anogeissus schimperi	1.8	13
Dichrostachys glomerata	1.7	31
Acacia adansonii	0.9	31
Acacia albida	-	-

The average stocking of the above species is 100 per acre, and they form 77% of the total recorded species.

Subsidiary species, including those of the shrub layer/

layer are:

Bauhinia reticulata - occasional.

B. rufescens - occasional.

Adansonia digitata - occasional to rare.

Hyphaene thebaica - occasional.

Lannea humilis - rare.

Dalbergia melanoxylon - rare.

Cadaba farinosa - frequent.

Cordia crenata - frequent.

Capparis tomentosa -, frequent.

Grewia tenax - frequent.

Cissus quadrangulus - occasional.

Combretum aculeatum - occasional.

Grewia villosa, - rare.

Cadaba glandulosa - rare.

Cordia rothii - rare.

The average stocking of all species is 131 per acre. The maximum height recorded in the association is 30' (9M) (emergant tree species), and the average height is 10.9' (3.3 M). Canopy is generally open, although over local patches of thicket growth it may be closed at 6' to 8' (1.8 to 2.4 M).

Grass growth is variable; under thickets it is sparse, but under an open canopy is usually fairly dense. Fourteen different species were recorded, of which the main ones are:

Aristida spp. - abundant (mainly A. funiculata and A. adscensionis).

Echinochloa colona - frequent.

Eragrostis gangetica - frequent.

Cenchrus biflorus - frequent.

The remaining species are all rare to locally occasional.

The importance of this association in forestry and land/

land use will be discussed in conjunction with the next association at the end of section (iii).

(iii) Riparian Thorn Forest Formation.

Acacia albida - Acacia tortilis - Ziziphus - Balanites Association.

This association is found on the sandy silt soils of wadi banks and flood plains. It approaches continuous closed growth more nearly than any other association in the area under review.

There are 18 enumeration plots in the association and the stocking and distribution data for 16 main species is given in the table which follows.

	Percentage of total stocking represented by each species.	Percentage of plots in which each species found.
Acacia tortilis	19.7	56
Acacia albida	14.4	100
Ziziphus mucronata	12.4	72
Balanites aegyptiaca	12.0	72
Ziziphus spina-christi	12.0	56
Acacia seyal	7.0	50
Acacia mellifera	4.5	28
Boscia senegalensis	3.7	22
Acacia adansonii	3.6	44
Albizzia sericocephala	3.2	44
Bauhinia rufescens	2.4	22
Bauhinia reticulata	1.6	35
Acacia sieberiana	1.3	39
Acacia nilotica	1.1	6
Anogeissus schimperi	0.7	11
Acacia campylacantha	0.4	22

The average stocking of the above species is 73 per acre and they form 76% of all the species enumerated. Other species recorded from riparian thorn forest are listed below. Those marked * are usually only found on riparian sites in or near to the area of volcanic soils, i.e., the richest, best watered sites in the whole area.

*Khaya/

* Khaya senegalensis - occasional.

* Cordia abyssinica - occasional.

* Ficus sycomorus - occasional.

* Ficus gnaphalocarpa - occasional.

Diospyros mespiliformis - occasional.

Tamarindus indica - occasional.

Hyphaene thebaica - occasional, locally frequent.

* Acacia hebecladoides - occasional.

* Ziziphus mauritiana - occasional.

Borassus flabellifer - rare.

* Albizzia aylmeri - rare.

* Phoenix reclinata - rare.

Typically, there is a shrub layer present although frequently it is discontinuous - probably the result of previous clearing for cultivation, leaving only the high-shade standing. The species present include -

Grewia tenax - frequent.

Cadaba glandulosa - frequent.

Cordia ovalis - frequent.

Dichrostachys glomerata - frequent.

Cordia crenata - occasional, locally frequent.

Cadaba farinosa - occasional.

Combretum aculeatum - occasional.

Grewia villosa - occasional.

Cissus quadrangulus - occasional.

Cordia rothii - rare.

Gymnosporia senegalensis - rare.

The average stocking of all species is 96 per acre. The average overall height of the stand is 39.7' (12 M), and heights of up to 45' (13.5 M) are not uncommon. The shrub layer goes up to 10' (3 M). Canopy is generally not completely closed, a good overall average would be 0.7 closure, (complete closure being unity).

The grass layer is usually well developed, and on good/

good sites attains 6' (1.8 M) in height. The two commonest species are Echinochloa colona (abundant) and Pennisetum ochrops (frequent). Other grasses include Tribulis terrestris, Cynodon dactylon, Andropogon gayanus, Dinebra retroflexa and Aristida spp. The herbs Cleome viscosa and Leonitis pallida are locally frequent.

From a forestry and land use view, riparian sites are of great importance. As a class, they constitute the most valuable land in the province. This is more particularly true in the case of sandy silts. After clearing the ground vegetation and shrub layer, cultivation of finger millet (Sorghum spp.) is carried on. Other crops grown without irrigation are snuff-tobacco, potatoes, chillies, and "bush" (perennial) cotton. Under irrigation from shallow wells, onions and wheat are grown. It should be noted that these cash crops are grown mainly in the area of the central massif and in the rain-shadow. The main cultivators are lowland Fur and immigrant 'Fellata' (mainly Muslim Fulani from West Africa literally working their way across the continent on the pilgrimage to Mecca). On less well watered sites to the north, and around Kas and Nyala to the south-east, riparian fringes are still highly prized for agriculture, but cropping is largely confined to Sorghum millet and a little tobacco.

From a herdsman's view-point, riparian belts are very valuable, as the common grass Echinochloa colona is very good fodder, and the fruit of Acacia albida is another very rich animal feed found under riparian thorn forest. The Beni Helba of southern district, instead of taking their animals south during the dry season to the permanent grazing on the Bahr el Arab river, come north and pasture their herds on the wadis of Zalingie district.

In the forestry world, riparian forest vegetation contains the total timber resources of the province. Khaya,/

Khaya, Cordia abyssinica, Ziziphus mucronata, Anogeissus and Diospyros are all being worked for timber, by hand sawing. All the timber produced is used within the province. The natural stands are logged, all mature trees over a fixed minimum girth being removed. Replacement of the cut is carried out by planting, which for convenience of management, is concentrated in forest reserves. These reserves are situated in riparian woodland.

As well as cultivation, grazing and sawn timber production, the province requirements of round building poles is met almost entirely from riparian thorn forest. Anogeissus is the first choice for a durable round pole, and cases are known to the writer of Anogeissus poles being transported 80 and 90 miles for roofing and building in the towns. Hauls of 30 to 50 miles are common. The enumerations show that this species is not well represented in riparian vegetation. This poor stocking may well be due to consistent over-exploitation of the species. Therefore in addition to replacing the species used in sawn timber, forest reserves, where near centres of population, include plantations of pole timber. Eucalyptus spp. are commonly used for this purpose.

In the riparian thornland formation, both cultivation and grazing are carried out, but to a lesser extent than in thorn forest. There are no timber resources in this formation, but near centres of population, inroads are frequently made for fuel-wood. In the case of Fasher town, the vegetation of the silty-clay plains of the Wadi Golo has been so cut over that only a relict association composed largely of Capparis decidua is now left. Blocks of this land in the Golo plain, amounting in all to several thousand acres, are in process of reservation, and their rehabilitation to supply Fasher fuel-wood demand is one of the/

the biggest jobs facing the Forests Department in Darfur. Complete protection by enclosure will, in course of time, achieve something, but in view of the urgent necessity of relieving pressure from the wide area (up to 45 miles radius) from which firewood is cut at present, artificial regeneration is being carried out in the reserves. The main species being used are Acacia adansonii on sites of maximum water onflow, and Acacia tortilis and Acacia mellifera (mainly the former) on the higher contours receiving less water. Contour ploughing of these higher sites is done before sowing, to stop surface run-off. By this method it was hoped that sufficient water would be made available on these sites to enable Acacia adansonii to be grown. Experiment proved this to be wrong, and less demanding species are now being used.

(iv) Ecological Order of Riparian Species.

Considering its small total area, riparian vegetation is, pro rata, subject to more interference by man than any of the other associations described. Man causes degradation of the vegetation by several means; selective cutting of one species, for example Anogeissus from thorn forest, or wholesale removal of all useful species, leaving only tree weeds as on the Golo plain at Fasher, or generally through over-grazing and browsing.

Another factor affecting the species distribution in the two formations is, that they differ greatly in stand structure, one being open thorn-bush, and other nearly closed forest. The much reduced light available under the latter, vis-a-vis the former, must adversely affect the numbers of light demanding species whose stature does not allow of them reaching the upper canopy; Acacia orfata/

orfota is a case in point; well represented in thornland, it is totally absent from thorn forest. This species is known to be a vigorous light-demander.

These two factors have a selective action which it is impossible to assess accurately, hence the order of the species as determined from their stocking data is not necessarily the order of ecological status. The only useful information which can be added to the order of species established for hard soils, is that at the higher end of the range, after Anogeissus and Acacia hebecladoides, come the following species:-

Bauhinia rufescens,
Bauhinia reticulata,
Acacia albida,
Ziziphus mucronata,
Acacia sieberiana,
Acacia campylacantha,

arranged, roughly, in the above order of increasing site requirements.

CHAPTER XII.

MOUNTAIN VEGETATION.

This is a very distinctive type of vegetation developed above the 5,500' to 6,000' contours on the central massif. On the basis of structure, it should not be classed as a woodland type; rather is it mountain grassland carrying sparse trees and shrubs.

On the basis of the arboreal composition, sparse as it is, two associations can be recognised. There is no sharp inter-association demarcation, rather the one grades into the other over a deep front. Similarly, the lower limiting altitude of the type is not a sharp demarcation. The transition between mountain vegetation and Anogeissus woodland to the west, and Albizzia-Acacia association to the east, takes place gradually. The altitude given is the approximate lower limit of Acacia albida, the type species of the lower association of mountain vegetation; above this limit, constituent species of the plains associations diminish in numbers and ultimately disappear.

Mountain vegetation is zoned, basically by altitude, and the zonation is skewed upwards on the west side by virtue of the heavier rainfall on that side. The following table gives the observed heights at which the major changes in the vegetation take place. These heights were obtained by altimeter in the course of several mountain journeys.

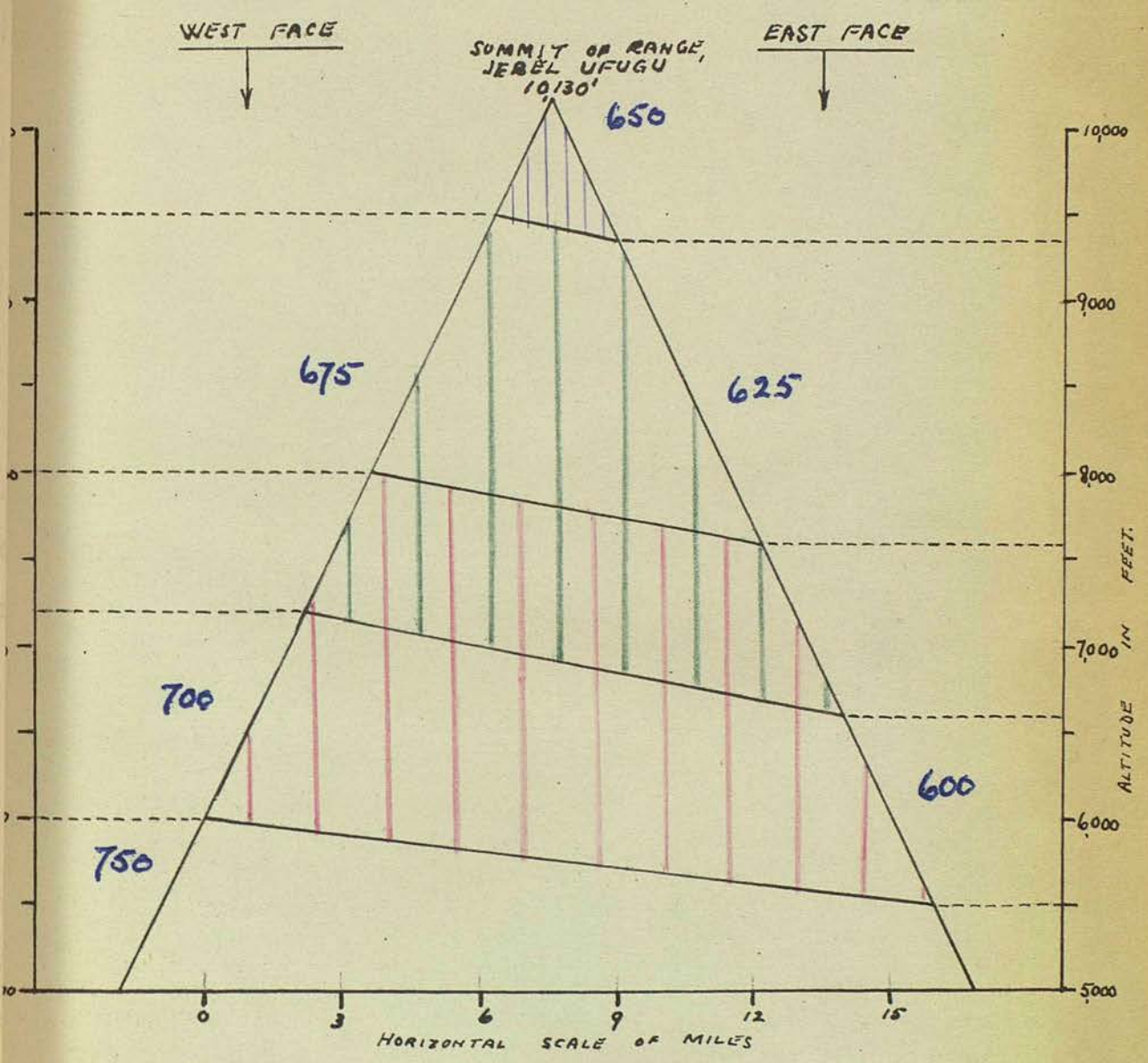
West side		East side
Above 9500' (2879 M)	Grasses and herbs only.	Above 9355' (2835 M)
9500' (2879 M)	Upper limit of Olea and Ficus palmata	9355' (2835 M)
8000' (2421 M)	Upper limit of Acacia albida	7600' (2303 M)
7200' (2182 M)	Lower limit of Olea and Ficus palmata	6600' (2000 M)
6000' (1818 M)	Lower limit of Acacia albida and of Mountain vegetation	5500' (1666 M)

The diagram which follows is a graphic representation of this data, with rainfall figures interpolated from the isohyet map. The figure is to scale, the vertical to horizontal scalar ratio is 20 to 1.

Geologically, the central massif is of volcanic origin, and the commonest rocks are basalt and volcanic tuff. The tuff is confined to the south end of the range, while the basalt is common throughout. The former is a very weak rock which erodes rapidly. It forms a very poor soil. Basalt weathers much more slowly, but gives rise to a rich soil. Erosion, both sheet and gully, is one of the features of the mountain zone.

The vegetation is open and generally sparse - there are extensive tracts, particularly on tuffs, with no tree vegetation at all, and a grass layer which, at most, gives not more than 50% ground cover. Large quantities of/

DIAGRAMATIC CROSS SECTION THROUGH JEBEL MARRA RANGE SHOWING EFFECT OF ALTITUDE & RAINFALL ON TREE DISTRIBUTION



COLOUR KEY.

GRASSES & HERBS ONLY.

OLEA CHRYSOPHYLLA & FICUS PALMATA.

ACACIA ALBIDA.

APPROX. RAINFALL FIGURES (MMs.) IN BLUE.

of soil forming materials are annually carried down the mountain streams and are the direct cuase of the high fertility of the wadi flood-plains, the riparian sites of the previous chapter. This erosion is not man-made or aided in any way.

There are no enumeration plots in this zone. The descriptions of the associations which follow have been compiled from notes made during animal treks.

Two associations can be recognised, and their boundaries have already been outlined. The lower one is:

Acacia albida - Cordia abyssinica Grassland Association.

The main constituents are -

Acacia albida - frequent.
Cordia abyssinica - frequent.
Ficus gnaphalocarpa - frequent.
Euphorbia candelabrum - occasional.
Ziziphus spina-christi - occasional.
Ficus glumosa - rare.
Dichrostachys glomerata - rare.
Grewia mollis - rare.
Boscia angustifolia - rare.

Stocking is very open - scattered trees and bushes over grass. The woody species at their densest do not exceed 15 per acre, and generally they are much less. In height Acacia albida and Ficus spp. run to 35' and Cordia abyssinica to 30'.

Grass is the dominant vegetation, and consists mainly of Hyparrhenia pseudocymbaria (here only 12" to 18" high as against 6' in Anogeissus woodland at 4500' altitude). Cymbopogon sp. near C. nervatus, Chloris sp. and Ctenium sp. Hyparrhenia is the commonest grass.

There is next a transition zone occupying 1000' in altitude, in the course of which all the species of this association/

association diminish in numbers and gradually drop out, while the species of the next association make an equally gradual appearance. This is an

Olea chrysophylla - Ficus palmata Grassland Association.

The main species are -

Olea chrysophylla - frequent.

Ficus palmata - frequent.

Rhus vulgaris - occasional.

Cussonia arborea - rare.

Salix sp. - locally occasional near water.

Note - Salix safsaf has been recorded from Jebel Marra but the sp. quoted above is not safsaf. It is probably S. hutchinsii, which Eggeling records from riparian sites at comparable altitude in Uganda. Authoritative identification of the specimen is not yet to hand.

Stocking is very poor. The trees are in fact so scattered that it is impossible to give an estimate of stocking per acre. In certain "dense" areas it might run to 5 or 10 trees per acre, but over large tracts it would be nil or a fraction of a tree per acre. Both the type species, but particularly Ficus palmata, tend to grow in hollows and drainage lines. Probably both increased water availability and shelter are causes of this.

Olea runs to 20' and exceptionally, 25'in height. Average height is 17', and the habit is a tree with a 5' trunk of 6" to 8" d.b.h. and a crown 12' deep by 12' maximum diameter.

Ficus palmata has a bush habit, 10' high on the average, by 10' crown diameter at maximum, and 5' at ground level.

The Salix has a tree habit, and growing in sheltered valleys/

valleys near running water, often reaches 20' in height. Frequently it is covered in the liane Clematis simensis.

The grass layer is again the dominant ground cover and consists mainly of: Hyparrhenia pseudocymbaria,

Hyparrhenia sp. near collina,

Hyparrhenia sp. near schimperi,

Andropogon spp.,

Themeda triandra,

Digitaria sp. and

Pterus aqualina.

This last species is very common, and is frequently the dominant ground herb between 7200' and 8500'. Other common herbs are the "Jebel Marra thistle" Echinops macrochactus, and the tall umbellifer Diplolophium africanum.

A very common tree parasite found in both associations is the mistletoe Loranthus globiferus. Observations indicate that this attacks between 33% and 50% of all the trees.

The foregoing is a very brief account of the tree constituents of a botanically very interesting area. Bews (1925) considers the mountain chain up east Africa as a plant highway, and Smith (1949) postulates the existence of side roads off this main route. Jebel Marra can be considered as a stepping-stone in one such side track. The presence of Olea seems to link it with the main highway in the Abyssinian highlands, and it is very probable that this, or other vegetational links, exist between the Marra and Tibesti ranges. The writer understands that a botanical collection was made in the Tibesti mountains in 1951/52. A similar collection was made on Jebel Marra early in 1953. When the results of these two collections are available it may be possible to establish a correlation between the two vegetations.

From/

From a forestry view-point, there is nothing of importance in this zone. It was at one time suggested that plantations of black wattle (Acacia mollissima) might be created in the mountains to give rise to a tan-bark industry. Research into the sylviculture of the species, however, revealed that to succeed on Jebel Marra, irrigation would be necessary. The amount of irrigation water available is limited, and the upland Fur cultivators have prior claim to it, so this project was abandoned.

Cultivation is carried on by the upland Fur, who are extremely skilled in soil conservation and water supply. All the cultivations are terraced with stone retaining walls and water is laid on to many of them by contour trench aquaducts taking off from behind a weir on a mountain stream. Common crops are wheat, onions, potatoes, tomatoes, chillies and citrus fruits (the latter introduced in the last two decades).

Works cited:

Bews, J. W. - "Plant Forms and their Evolution in South Africa"; London, 1925.

Smith, J. - "Tree Distribution in Relation to Rainfall and Soil Texture"; Khartoum, 1949.

CHAPTER XIII.

CONCLUSIONS.

The vegetation of Central Darfur can be divided into four Formations on physiognomic characteristics. These are:-

Semi-Desert Scrub,

Thorn Savanna,

Woodland Savanna, and

Mountain Savanna or steppe.

Each formation can be sub-divided into different edaphic units, and ultimately into distinct Associations on specific grounds. Twelve associations are recognised.

Each association is a distinct and separate entity, and can be recognised on the ground. In only one case has mention been made of an association being in a probable state of ecological advance. The position of the remainder is difficult to assess. In the section on the Acacia mellifera - Commiphora - A. orfata - A. tortilis Association it was stated that this was probably the climatic climax association of Thorn Savanna. This is not strictly correct, as the writer views this, and other associations, as being in a state of dynamic equalibrium at, or near, the deflected climax. That is, the climatic climax, deflected through the effect of man and his animals. What the true climax is, will not be known until the effect of several decades of complete protection on selected areas can be studied. The writer suggests that the present deflected climax is probably not far removed from the climatic climax, because the incidence of man is not severe.

Apart from the Albizzia - Acacia Association, to which mention has already been made, the writer saw no evidence/

evidence to suggest an advance, either ecologically or geographically, in any of the associations. Conversely, apart from degradation of the vegetation in the vicinity of towns, there is no evidence of a retreat in any association.

In dealing with some of the associations, particularly the northern ones, the remark, 'of little interest to forestry' will be found. What is really meant by that, is, that these associations are of no use for afforestation, or the commercial aspects of forestry. They are, of course, of inestimable value in a protective role; soil protection, and also to a lesser degree, maintenance of the regional climate, and water supplies. Destruction of thorn savanna and thorn scrub, resulting in soil instability, accelerated erosion, dust storms and reduced water supplies, are to be seen, all too frequently, in the Sudan, and elsewhere in Africa.

The ecological order established for the different species, should be of use to all who deal with land-use. From an inspection of an area, an estimate of its value can be made from the ecological status of the various species present. Further, if the climatic value be known, then the species, and their propotions, gives a direct measure of the edaphic value of the site. Some such method of assessing site-values is constantly required in forestry, and in other professions dealing with land.

NOTE on the VEGETATION MAP.

The vegetation map immediately following has been prepared by the writer from field data. The actual areas of the associations, as shown coloured on the map, is given below. In most cases, this does not cover the total area of the association occurring in the province; it is only the occurrence either actually investigated, or coming within the limits of the central zone as defined for this paper.

	Area (sq. mls.)	Total
Semi Desert Scrub		
Maerua - Capparis Association	3,540	3,540
Thorn Savanna		
Acacia mellifera - A. orfota - Boscia Association.	5,802	
Acacia mellifera - Commiphora - Boscia Association.	7,940	
Acacia mellifera - Commiphora - A. orfota - A. tortilis Association.	12,280	
Albizzia - Acacia Association	9,240	
Acacia senegal - Balanites - Guiera Association (on sand)	9,196	44,458
Woodland Savanna		
Anogeissus - Acacia seyal - Lannea - Albizzia Association.	11,260	
Acacia senegal - Combretum - Guiera - Lannea Association (on sand).	11,530	22,790
Mountain Vegetation	376	376
Grand Total		71,164

Note:- The area of Riparian Vegetation has not been calculated separately. It amounts to approximately 500 sq. mls.

22 22 | 23 23 | 24 24 | 25 25 | 26 26

Kuttum

Mellit

Khuzit

Gaasa

Zalingei

Mukjar

Nyala

Kass

Kebkabiya

Tawila

Idenaki

Mittereai

Gereida

Muhajeriya

Tendelti

Buram

Kolbus

Tullus

Shearia

Um Kadada

Um Dukhun

Um Hagar

Um Labbasa

Um Gumbura

Um Dafoug

Um Shalaya

Um Kharoba

Um Kharaba

Um Hawasa

Um Hawasa

Um Gumbura

Um Labbasa

Um Dukhun

Um Kadada

Wadi Kaja

Wadi Kaja

Wadi Kaja

26 27 28

16

15

14

13

a Plateau

W. MARGUR

Meidob Hills

Shaqq el Gireifer

Hills

Tagabo

Berti

W. Elba

W. Sayah

Mellit

W. Beida

Khurait

Abyad.

UmmKaddada

Kordofan Prov.

Dam Gamad

W. El Ku

Wada'a

CENTRAL DARFUR.

From the One Million International Map.

VEGETATION MAP

SHOWING ASSOCIATIONS.

KEY.

Wadis — W. Wilgid

Roads recorded over

Other Roads

Mountains & Hills — Berti Hs.

District H.Q. Names Underlined.

KEY TO COLOURING.

- Maerua–Capparis Association
- Acacia senegal–Balanites–Guiera–Association (on sand)
- Acacia mellifera–Acorfata–Boscia Scrub Association
- Acacia senegal–Combretum–Guiera–Lannea Association (on sand)

Misterai
W. Kaja
W. Barei
Mornei
W. Azum
Zalingei
W. Azibo
Kargula
Gallabat
Barida
Arara
Hasila
W. Sarei
Dereisa
W. Kaja
W. AZUM
W. Gebarei
W. Saleh
Mogoroto
Garsila
Kubbum
Gurgor
Gulau
Kebe
Nyerkerei
W. Sanie (Azum)
Torra
Oariya
MARRA MASSIF
Soni
Deriba
Kalokiring
Limo
W. Kas
Kas
W. Bulbul
W. Harsia
Bulbul
Tarnei
W Abu Zoreiga
Dobo
Genning Hills
Meltma
Kidingir
W. Amer
Moshu
W. Azum
W. Abu Hamra
W. El Ku
Wada'a
Mimawaskei
W. Amer
W. Defois
Beringil
W. Wilgid
Nyala
W. Umm Kardus
W. Nyala
Mahugeriya
Da
22
23
24
25
26

Wadi El Ku

Wada'a

Umm Kutkut

Beringil

Mahugeriya

Umm Sauna

Hosh Hamilla

Dasin

Abu Matarig

Wadi Hosh

Radhir

Tawaishia

Gezmatsetin

26

27

28

KEY TO COLOURING.

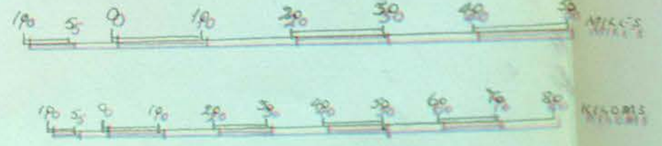
- Maerua—Capparis Association.
- Acacia mellifera—Aloe spp.—Boscia Senna Association.
- Acacia mellifera—Commiphora—Boscia Association.
- Acacia mellifera—Commiphora—Acacia tortilis—Aloe spp. Association.
- Albizzia spp.—Acacia Association.
- Acacia senegal—Balanites—Guiera—Acacia senegal—Balanites—Guiera—Association (on sand).
- Acacia senegal—Combretum—Guiera—Acacia senegal—Combretum—Guiera—Lannea Association (on sand).
- Anogeissus—Acacia segal—Lannea—Albizzia Association.
- Riparian Vegetation.
- Mountain Vegetation.

SCALE

1 to 1,000,000

1 Inch to 15.78 Miles,

1.014 Inches to 16 Miles



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Appendix 1.

List of trees, Shrubs,

Grasses & Herbs

LIST OF TREES AND SHRUBS CITED.

A

Acacia adansonii Guill. and Perr.

Acacia albida Del.

Acacia ataxacantha D.C.

Acacia campylacantha Hochst. ex A. Rich.

Acacia hebecladoides Harms.

Acacia laeta R. Br.

Acacia mellifera Benth.

Acacia nilotica (L.) Del.

Acacia orfota (Forsk.) Schweinf.

Acacia raddiana Savi.

Acacia senegal (L.) Willd.

Acacia seyal Del.

Acacia sieberiana DC.

Acacia tortilis (Forsk.) Christensen

Adansonia digitata Linn.

Albizzia anthelmintica (A.Rich.) Brongn.

Albizzia sericocephala Benth.

Anogeissus schimperi Hochst. ex Hutch. & Dalziel

B

Balanites aegyptiaca Del.

Bauhinia reticulata (DC.) Oliv.

Bauhinia rufescens Lam.

Borassus aethiopum Mart.

Boscia angustifolia A. Rich.

Boscia senegalensis (Pers.) Lam. ex Poir.

Boscia salicifolia Oliv.

Boswellia papyrifera Hochst.

C

Cadaba farinosa Forsk.

Cadaba glandulosa Forsk.

Calatropis procera (Ait.) Dryand.

Capparis decidua (Forsk) Edgew.

Capparis tomentosa Lam.

Cassia ashrek Forsk.

Cissus quadrangulus Linn.

Clematis simensis Fresen.

Combretum aculeatum Vent.

Combretum cordofanum Engl. & Diels.

Combretum elliotii Engl. & Diels.

Combretum ghasalense Engl. & Diels.

Combretum hartmannianum Schweinf.

Combretum undulatum Engl. & Diels.

Commiphora africana (Arn.) Engl.

Cordia abyssinica R. Br.

Cordia crenata Del.

Cordia ovalis R. Br.

Cordia rothii Roem. & Schultes.

D

Dalbergia melanoxylon Guill. & Perr.

Dichrostachys glomerata (Forsk.) Chiov.

Diospyros mespiliformis Hochst. ex A.DC.

E

Euphorbia candelabrum Trem. & Kotschy.

F

Ficus glumosa Del.

Ficus gnaphalocarpa (Miq.) A. Rich.

Ficus palmata Engl.

Ficus sycomorus Linn.

G

Grewia flavescens Juss.

Grewia mollis Juss.

Grewia tenax (Forsk.) Fiori.

Grewia villosa Willd.

Guiera senegalensis J.F. Gmel.

Gymnosporia senegalensis (Lam.) Loes

H

Hyphaene thebaica Mart.

I

Irvingia sp.

K

Khaya senegalensis (Desr.) A. Juss.

Kigelia aethiopica Decne.

L

Lannea humilis (Oliv.) Engl.

Lannea schimperi (Hochst. ex A.Rich.) Engl.

Leptadenia spartium Wight.

Loranthus globiferus A. Rich.

M

Maerua angolensis DC.

Maerua crassifolia Forsk.

Maesa lanceolata Forsk.

O

Olea chrysophylla Lam.

P

Phoenix reclinata Jacq.

Prosopis africana Taub.

R

Randia nilotica Stapf.

Rhus vulgaris Meikle.

S

Salix hutchinsii Skan. (?)

Salvadora persica Linn.

Sclerocarya birrea (A.Rich.) Hochst.

Sterculia setigera Del.

Stereospermum kunthianum Cham.

Strychnos innocua Del.

Syzygium guineense (Willd.) DC. Sensu lato.

T

Tamarindus indica Linn.

Terminalia brownii Fresen.

Terminalia macroptera Guill. & Perr.

Z

Ziziphus mauritiana Lam.

Ziziphus mucronata Willd.

Ziziphus spina-christi Lam.

=. =. =. =. =.

GRASSES.

Andropogon gayanus Kunth. var squamulatus Stapf.

Andropogon gayanus Kunth. var bisquamulatus Hack.

Aristida adscensionis Linn.

Aristida funiculata Trin. & Rupr.

Aristida mutabilis Trin. & Rupr.

Aristida pallida Trin. & Rupr.

Aristida plumosa Linn.

Aristida stipoides Lam.

Backeropsis sp.

Cenchrus biflorus Roxb.

Cenchrus ciliaris Linn.

Cenchrus prierurii Hochst.

Chloris gayana Kunth.

Chloris pilosa

Chloris prieurii

Ctenium elegans Kunth.

Cymbopogon nervatus Chiov.

Cymbopogon proximus Stapf.

Cynodon dactylon Pers.

Dinebra retroflexa Stapf.

Dactylotenium aegyptium

Echinochloa colona Link.

Eragrostis gangetica Link.

Eragrostis tremula Hochst.

Hyparrhenia cymbaria Stapf.

Hyparrhenia pseudocymbaria Stapf.

Panicum turgidum Forsk.

Pennisetum ochrops Trin.

Pennisetum polystachum Schult.

Schmidtia pappophoroides Steud.

Schoenfeldia gracilis Kunth.

Setaria verticillata P. Beauv.

Sorghum lanceolatum Stapf. Sensu lato.

Sporobolus glaucifolius Hochst.

Sporobolus pyramidalis Hochst.

Tetrapogon spathaceus

Themida triandra Forsk.

Tribulus terrestris Linn.

Urochloa trichopus Stapf.

APPENDIX II.

P H O T O G R A P H S.

All the photographs reproduced here have been taken by the writer.

The arrangement in this section is by formations and associations.

SEMI DESERT SCRUB.

Maerua - Capparis Association.

1. Left centre, round bush Capparis decidua, remainder Maerua crassifolia. Sandy soil, note good grass cover, mainly Cenchrus biflorus and Panicum turgidum.

Shows well the very scattered nature of the tree vegetation.

THORN SAVANNA.

Acacia mellifera - A. orfota - Boscia Scrub Association.

2. Stony plateau between Umm Buru and Furawaiya. Vegetation in runnel, Acacia mellifera, A. orfota, Boscia senegalensis.

Very similar terrain to enumeration plot 91.

3. Mellit - Kutum road. Shows the open nature of this association. Basement complex grit soil. Volcanic hill in background carries same association.

Acacia mellifera - Commiphora - Boscia Association.

4. From a hilltop on the Mellit - Kutum road. Commiphora in centre and to left. Acacia mellifera to right. Basement complex grit soil. Thin cover Aristida grass.

5. Enumeration plot 97, 20 miles west of Karnoi. Large Boscia to right, Acacia mellifera and Commiphora in centre. Grass cover exceptionally good for this association.

6. 20 miles NW of Dor on the Umm Buru road. Acacia mellifera - Commiphora on Nubian sandstone grit soil, derived from the hill in the background. Typical sparse grass cover.

7. East of Kulbus near plot 104. This low panorama is a good general impression of the association occurring on sedentary grit soils.

Acacia mellifera - Commiphora - A. orfota - A. tortilis Association.

8. General view of this association in the Genning jebels, east of Jebel Marra. Mainly Acacia mellifera in foreground, with some A. tortilis in middle distance.

9. On the Suni road, 15 miles west of Melemm. Altitude approx. 3500'. Large Acacia mellifera on right. Ziziphus spina-christi in left foreground.

Commiphora and A. tortilis in background.

10. Enumeration plot 86, between Kutum and Dor. Despite the low rainfall (350 mm.) note the fairly good growth. Mainly Acacia tortilis, A. mellifera and A. senegal in photo.

Albizzia - Acacia Association.

11. Between Kidingir and Kas. Large Acacia seyal in foreground with Albizzia and A. mellifera in under-storey.

12. 5 miles west of Kas, similar to plot 137. Vegetation appears more open in the photo than is actually the case.

A sandy grit soil; grass burned off.

THORN SAVANNA ON SAND.

13. Between Mahugeria and Nyala. Acacia senegal and Balanites on hard sand ('s' site), Note open stocking and good grass cover, 9" to 12" high. Photo taken from height of 15'.

14. Between Mahugeria and Nyala. Acacia senegal, Balanites and Albizzia on 's' site looking on to an 'ss' site in background.

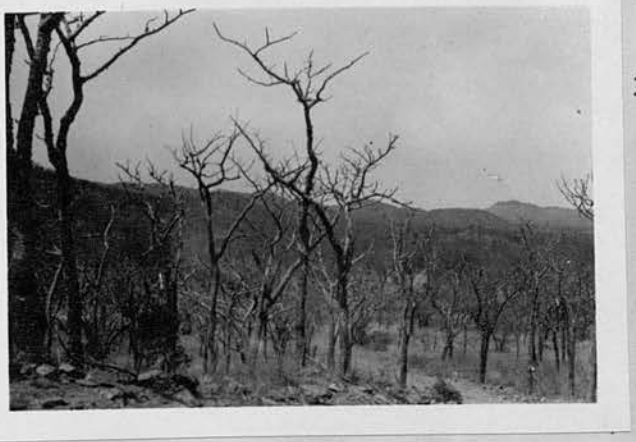
15. Close-up of approximately 12 year old Acacia senegal tapped for gum. The main stem has a large tapping wound probably 3 years old, but is not exuding gum. The branch to left has been tapped this season and the strip of torn-off bark may be seen hanging at 'X'. No tears of gum visible. Date of photo 21:3:53.

16. Foreground vegetation left to right Guiera senegalensis (2) and Balanites aegyptiaca. Acacia senegal in background. Vegetation appears more dense than is actually the case. Large Guiera is 14' high.

WOODLAND SAVANNA ON SAND.

17. Open woodland savanna with left to right, Terminalia macroptera (1) Stereospermum (2), and Combretum cordofanum (3).

ANOGEISSUS WOODLAND SAVANNA.



18. Consociation of Boswellia papyrifera on hillside between Arara and Habila. Note good stocking.

19. Kebe central forest reserve near plot 147. Anogeissus schimperi dominant. Close stocking, height 25'.

20. Another view of the same association, looking up the north fireline of the reserve. Dark tree in left middle distance is an Acacia hebecladoides.

21. Boswellia papyrifera (1), Anogeissus (2), and Lannea humilis (3) in foreground with Dichrostachys glomerata (4) in understorey. Soil basement complex grit plus some volcanic material.

Near Guldu.

RIPARIAN VEGETATION.

Riparian Thornland.

22. Consociation of Acacia mellifera on a cracking clay. Pronounced 'n' site of catena between Mahugeria and Nyala.

23. Another 'n' site with Acacia mellifera, but more typically open. 's' site in background. Same situation as 22.

24. Riparian vegetation on the Wadi Umm Buru, 5 miles east of the village of the same name. Consists mainly of very scattered, large, over mature Acacia albida. Large Ziziphus mucronata on left edge.

25. Kutum pole-plantation site on the south bank of Wadi Kutum. Dominant Acacia albida showing habit resulting from repeated lopping for browsing. Foreground cultivated. Ziziphus mucronata and Balanites in background.

26. The Wadi Tini (Howar) at Tini, taken from the International boundary up the centre of the wadi. Note almost closed vegetation. Mainly Acacia albida, A. seyal and Ziziphus spp.

27. Riparian vegetation on the Wadi Azum flood plain, near Kargula. Large Acacia albida and Ziziphus mucronata. Understorey cleared and land cultivated. Stalks of Sorghum sp. millet seen lying in foreground.

28. Another view of the Wadi Azum plain nearer to Zalingei. High canopy more open, and again ground undermath cultivated.

29. Lake Undur showing the dense riparian growth of Acacia nilotica immediately on the water's edge. Photo taken from plot 100 looking NE.

30. Lake Undur. Dead Acacia sp. some distance back from the water. Species indeterminable. Nearby living trees are A. adansonii. Local information has it that these are A. nilotica killed by the lake failing to rise for a period of 3 years.

31. Wadi Nyala at Nyala in spate. 8 a.m., 10th May, 1953. Photo taken at inside of bend; water 12' deep, flowing at 10 knots, and waves up to 4' high. This was an exceptionally early and strong flood.

MOUNTAIN ZONE.

32. The perennial R. Jawa 3 miles east of Suni. Note the very open vegetation both on the banks and inland.

33. East side of Jebel Marra at 9500'. Olea chrysophylla confined to water runnel down hill side.

34. View from NNW of the lake inside Deriba first crater. Large trees to left and right are Olea and stunted tree in right centre is Acacia albida.

35. Deriba craters, showing the second crater (later intrusion) inside the first. Altitude of photograph 8000'. Note the erosion gullying of the volcanic tuff and complete lack of arboreal vegetation.

36. Gully scour to the north of Deriba. Tree vegetation largely confined to valleys, and slope cover so poor that any rain immediately runs off, turning valley into raging torrent and uprooting trees in its path. Dead trees and debris litter the valley floor.

Pages 1 -3, plus
sheets 1 - 20.

APPENDIX III.

RUNNING RECORDS of the VEGETATION.

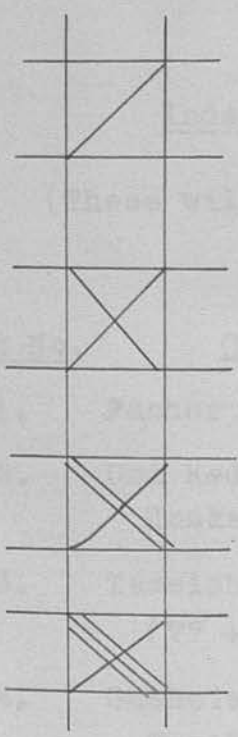
Appendix III.

Running Records of the Vegetation.

The twenty sheets which follow comprise the vegetation records covering 2,295 miles of road in central Darfur.

The unit of distance covered by each entry is two miles. Each vertical column of figures is headed by a figure which is the distance in miles from the start point to the commencement of that particular two mile stage. Thus the column headed 34 covers the vegetation between 34 and 36 miles from the start point.

In general, only the main or tree species are listed, but including those of only local importance or occurrence. In areas where the vegetation is sparse, shrub species have been listed as well. The following symbols have been used to indicate relative frequencies:-



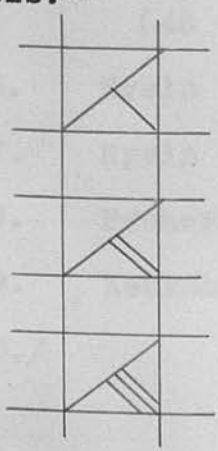
Indicates that the species occurs in that step, either as a rare or as an occasional member of the community.

Indicates a frequent occurrence.

Indicates an occurrence in some abundance.

Indicates a very abundant occurrence.

Localised occurrences are indicated by the following symbols:-



Locally frequent.

Locally abundant.

Locally very abundant.

It is particularly stressed that these symbols express the frequency of a species relative to the other members of that particular association. The use of the same symbol in different associations does not imply that the numerical representation is the same in both cases. For instance to give an example, in an open thorn savanna association 400 individuals of one species in two miles might justify the use of the 'frequent' symbol, whereas in the much denser Anogeissus woodland this same figure would only qualify for an 'occasional' symbol.

The entry (W) after the name of a species indicates that its occurrence is mainly confined to riparian sites. The frequency symbol used denotes degree of occurrence on such sites only. These species do not generally form part of the 'country' association.

Index to the Record Sheets.

(These will be found immediately following).

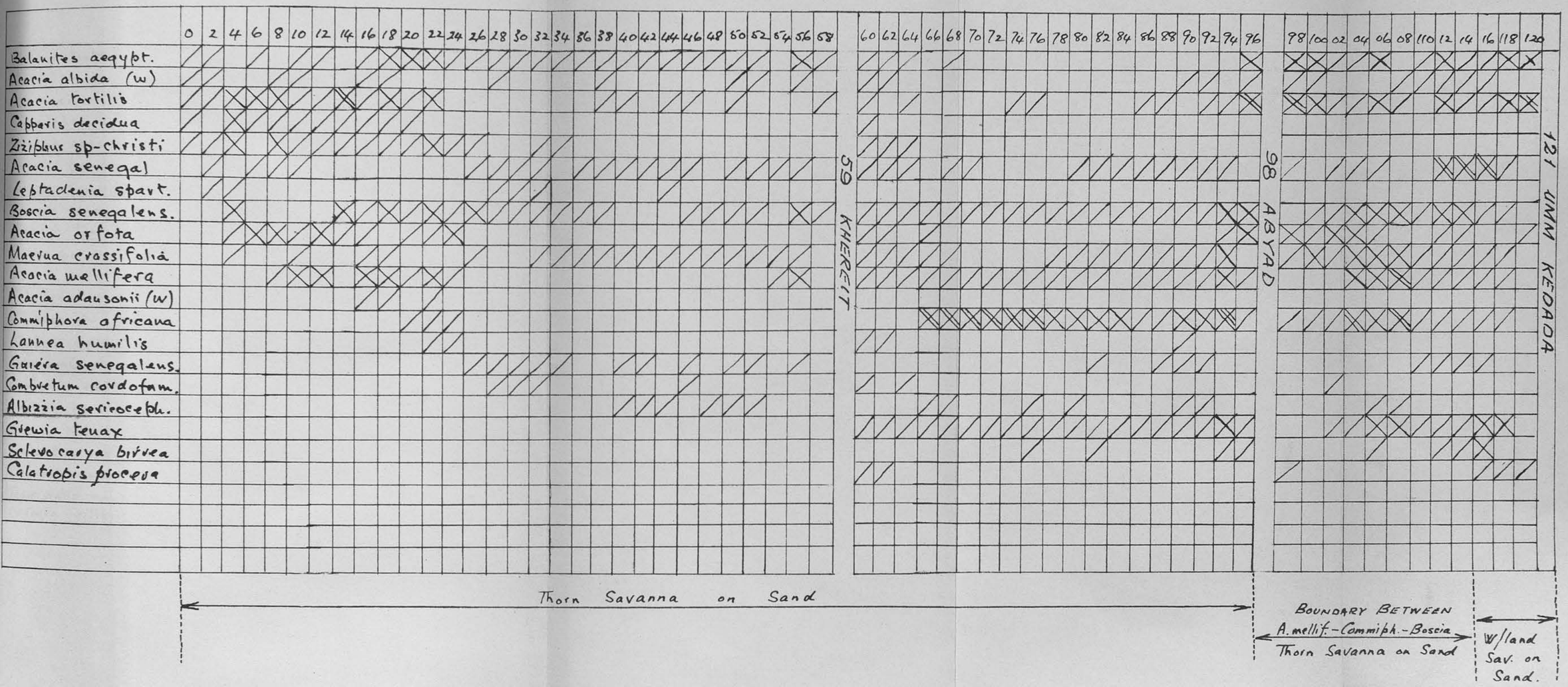
Sheet No.	Covering the road between	Distance
1.	Fasher - Abyad - Umm Kedada	121 mls.
2.	Umm Kedada - Umm Hosh - Taweisha - Heskanita.	129 mls.
3.	Taweisha - Wada'a - Mahugeria (77 + 59)	= 136 mls.
4.	Ghabeish - Heskanita - Umm Sauna - Umm Kutkut.	109 mls.
5.	Umm Sauna - Mahugeria - Nyala (45 + 53)	= 98 mls.
6.	Nyala - Fasher via Mosku	135 mls.
7.	Nyala - Fasher via Melemm	143 mls.
8.	Fasher - Kebkabiya	93 mls.
9.	Kebkabiya - Zalingie - Kas (70 + 66)	= 136 mls.

10./

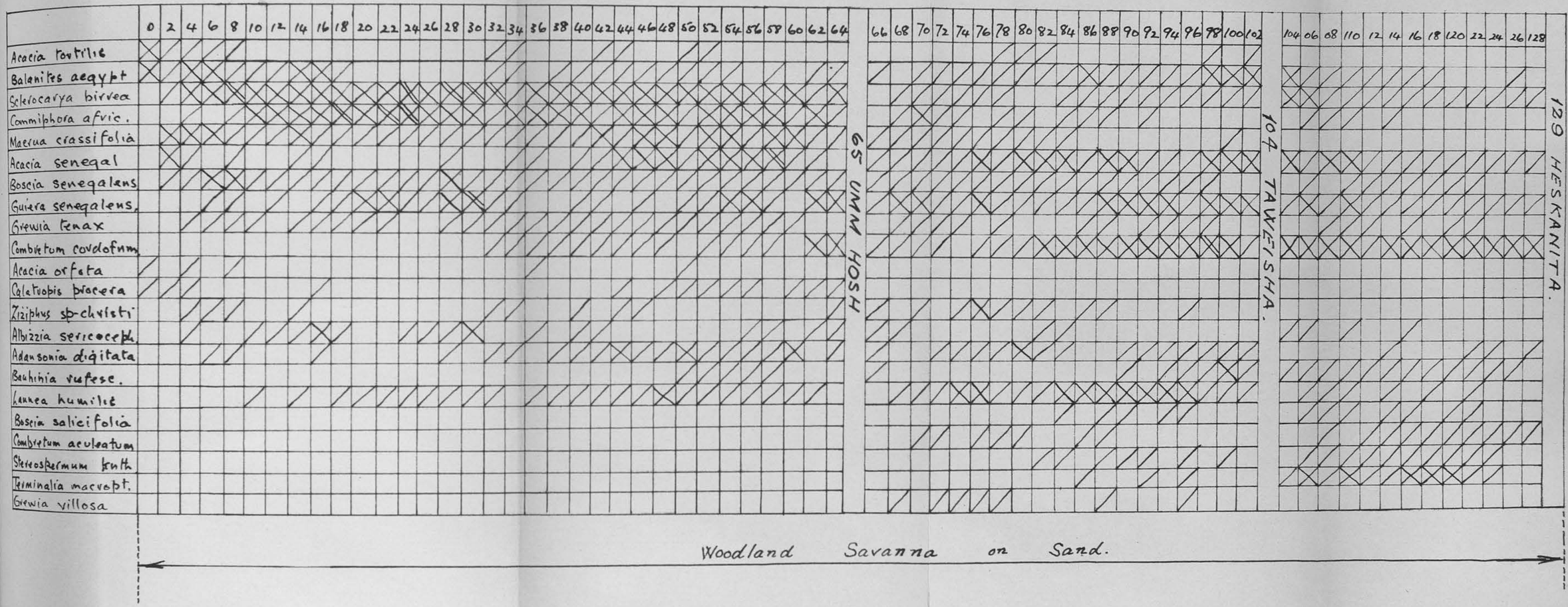
Sheet No.	Covering the road between		Distance
10.	Nyala - Kas and Melemm - Wadi Minawashie (54 + 21)	=	75 mls.
11.	Geneina - Arara - Habila		131 mls.
12.	Habila - Zalingie - Wadi Gallabat (79 + 12)	=	91 mls.
13.	Geneina - Kebkabiya		116 mls.
14.	Kebkabiya - Kutum - Fasher.		133 mls.
15.	Fasher - Mellit - Kutum		117 mls.
16.	Kutum - Umm Buru - Furawaiya - Baweira		130 mls.
17.	Furawaiya - Tini - Kulbus.		123 mls.
18.	Kulbus - Sileaia - Geneina and Tundubai - Lake Undur (69 + 7)	=	76 mls.
19.	Zalingie - Kebe - Guldu - Kebkabiya		91 mls.
20.	Tawilla - Guldu - Kebe - Nyertetie - Kas. (83 + 29)	=	112 mls.

Total mileage = 2295.

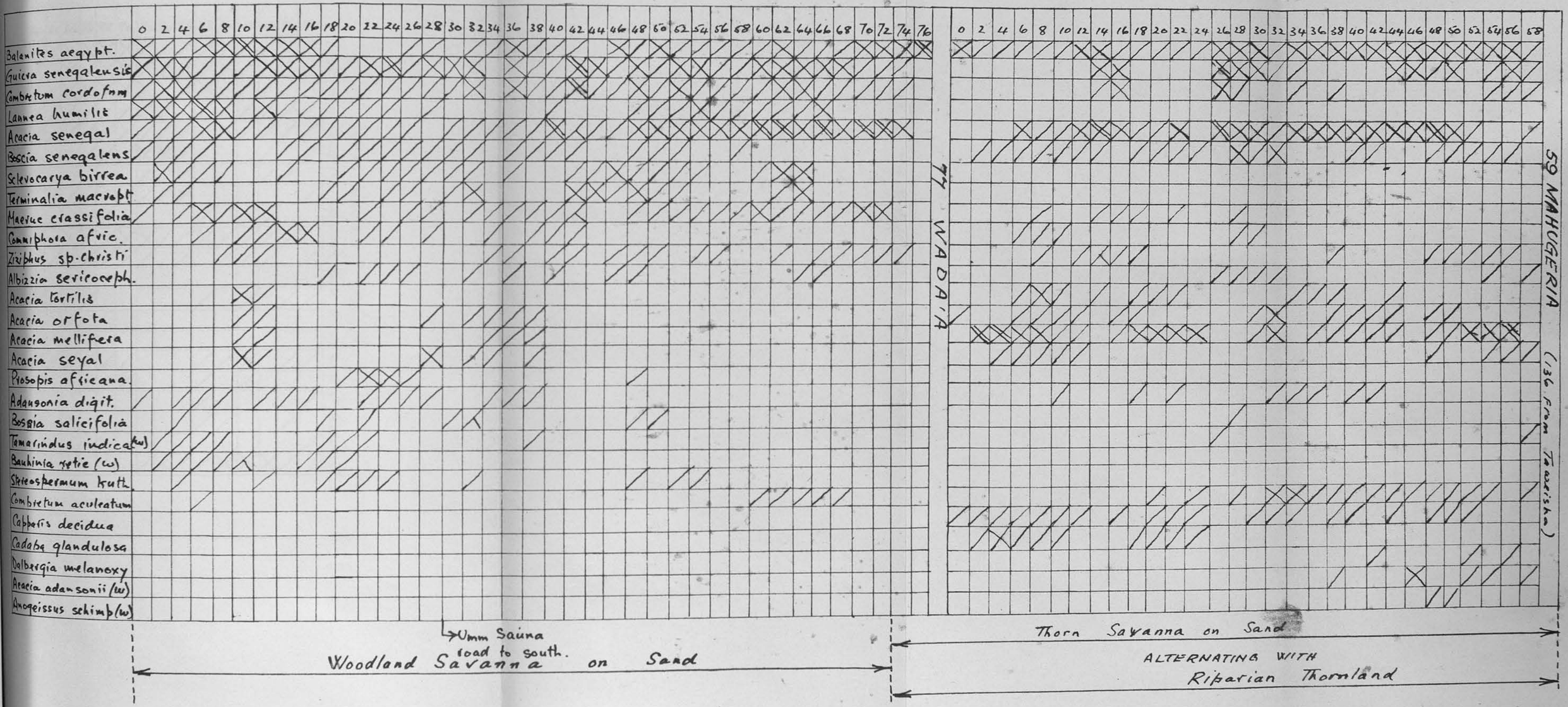
FASHER - ABYAD - UMM KEDADA.



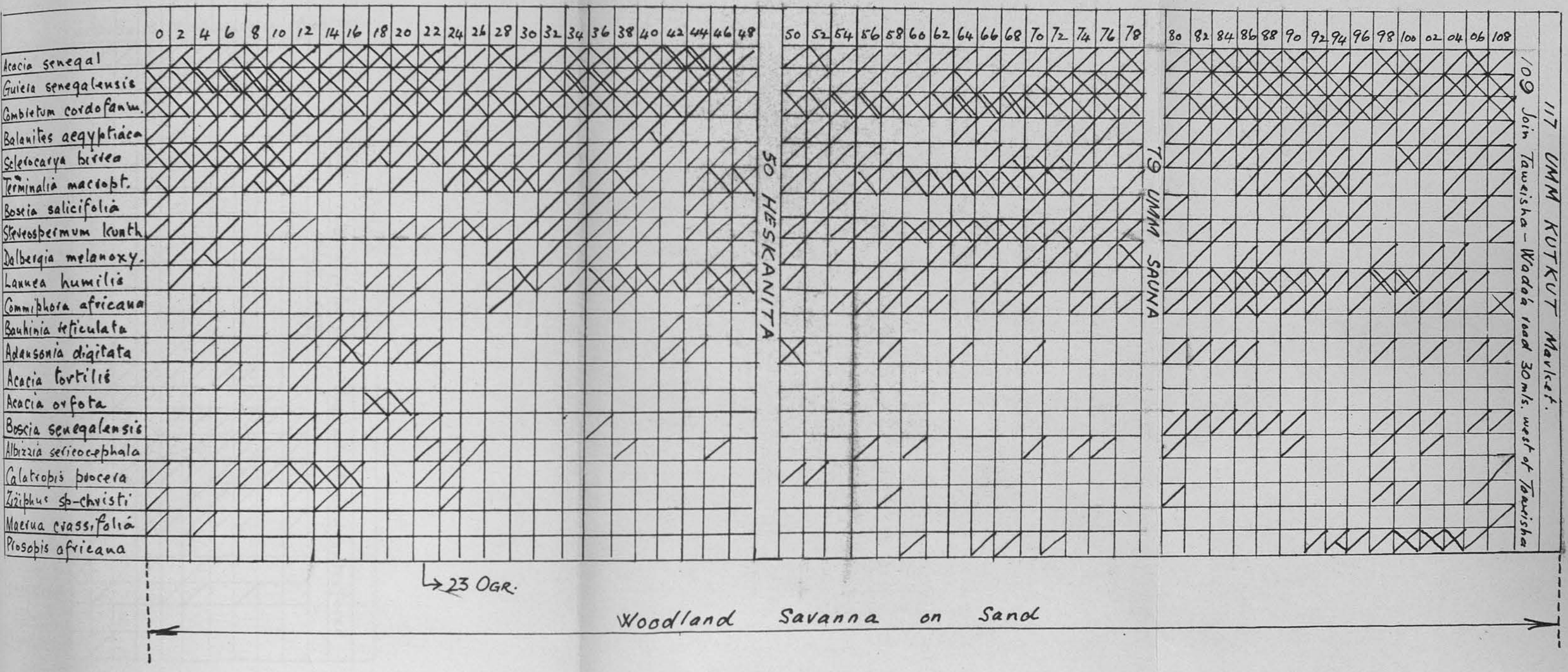
UMM KEDADA - UMM HOSH - TAWEISHA - HESKANITA.



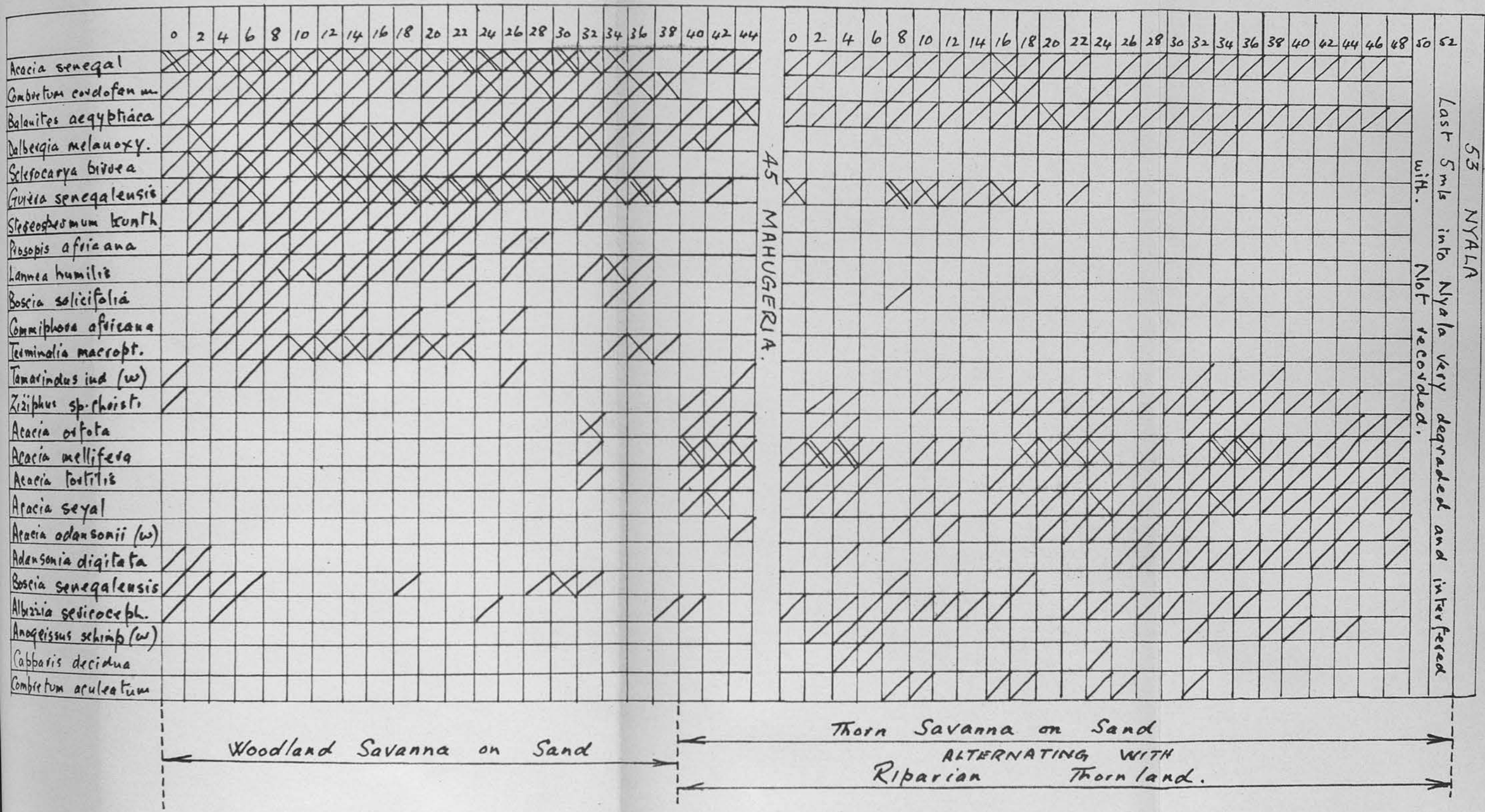
TAWEISHA - WADA'A - MAHUGERIA.



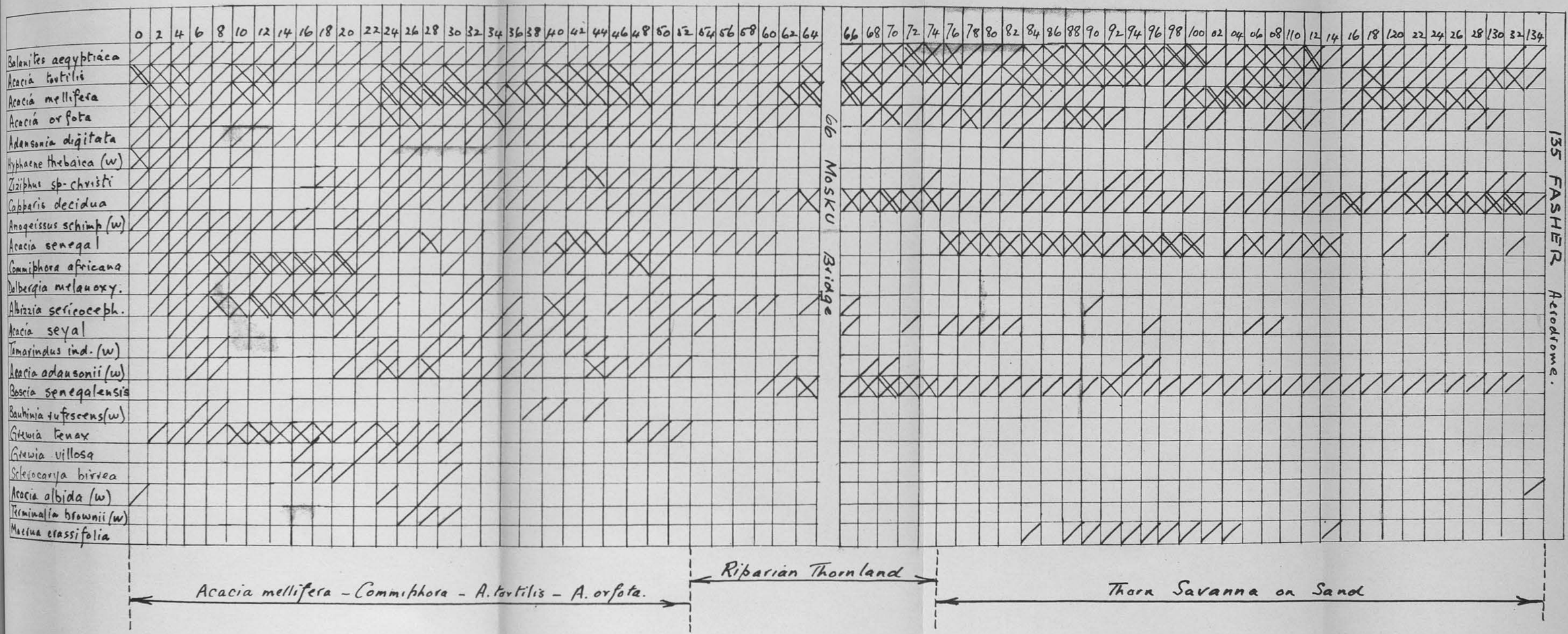
GHABEISH – HESKANITA – UMM SAUNA – UMM KUTKUT.



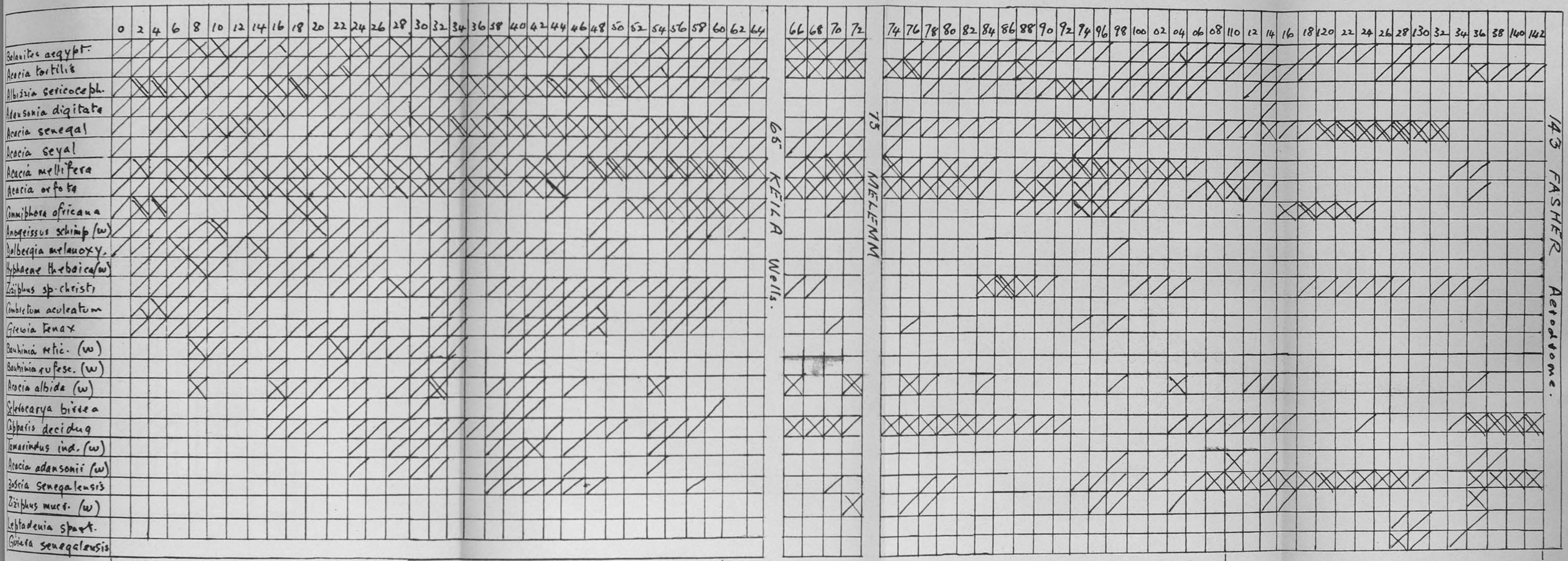
UMM SAUNA - MAHUGERIA - NYALA.



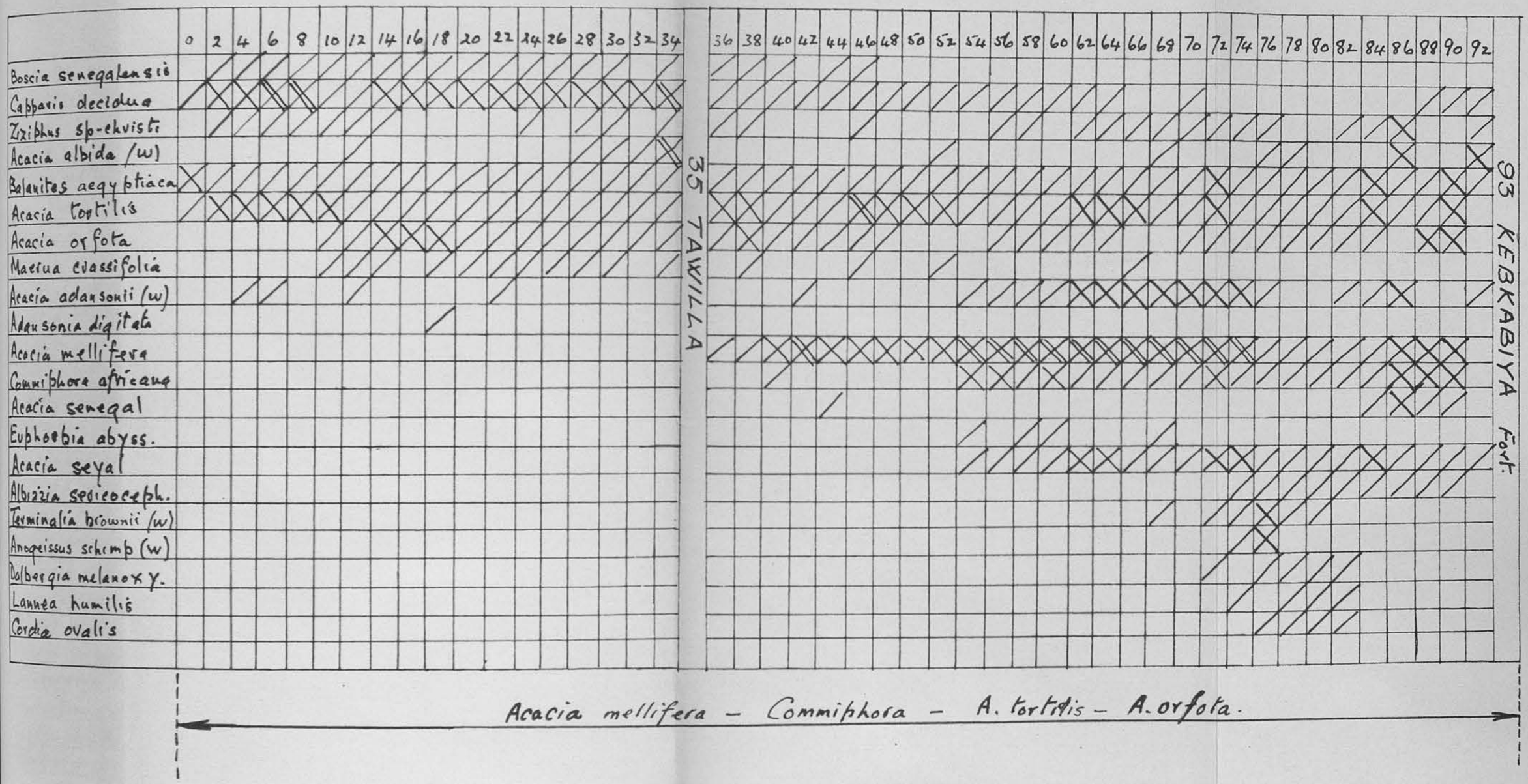
NYALA - FASHER via MOSKU.



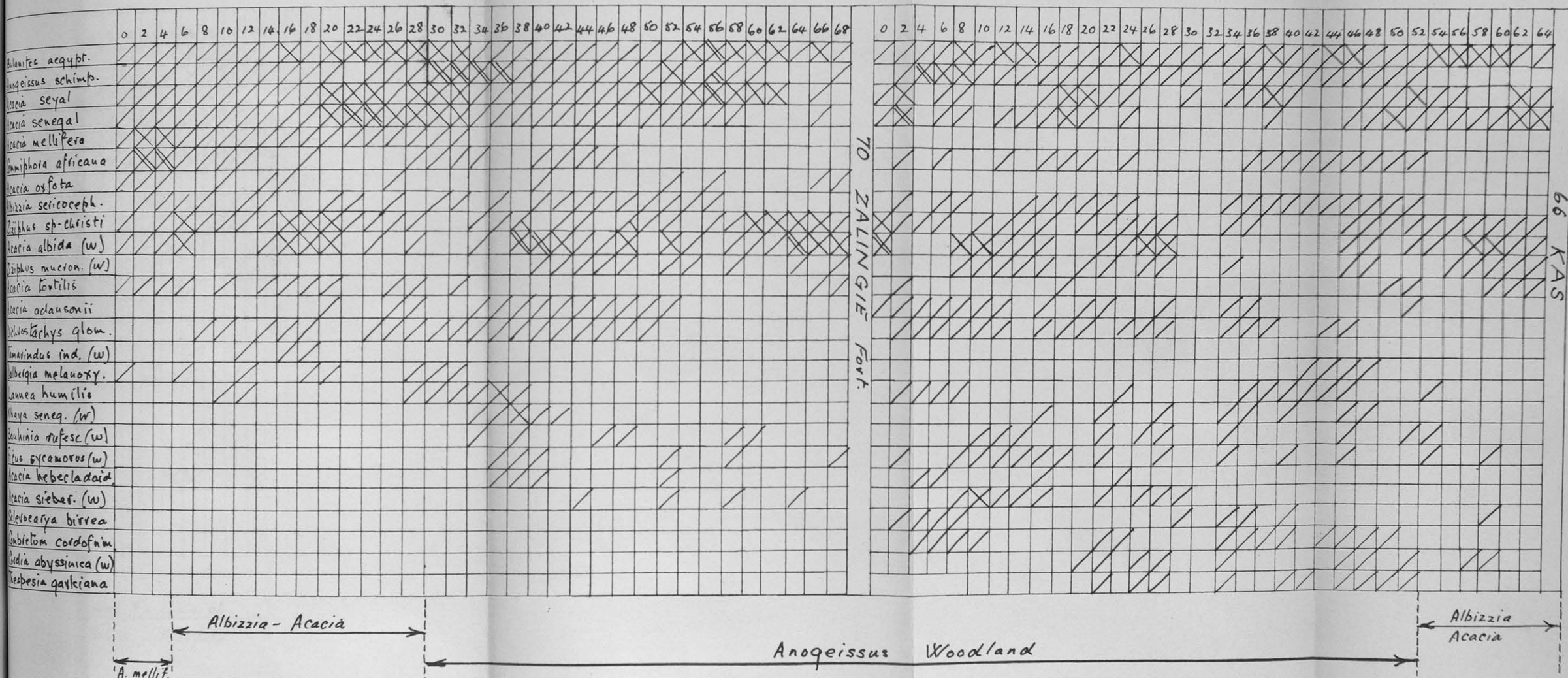
NYALA – FASHER VIA MELEMM.



FASHER - KEBKABIYA.

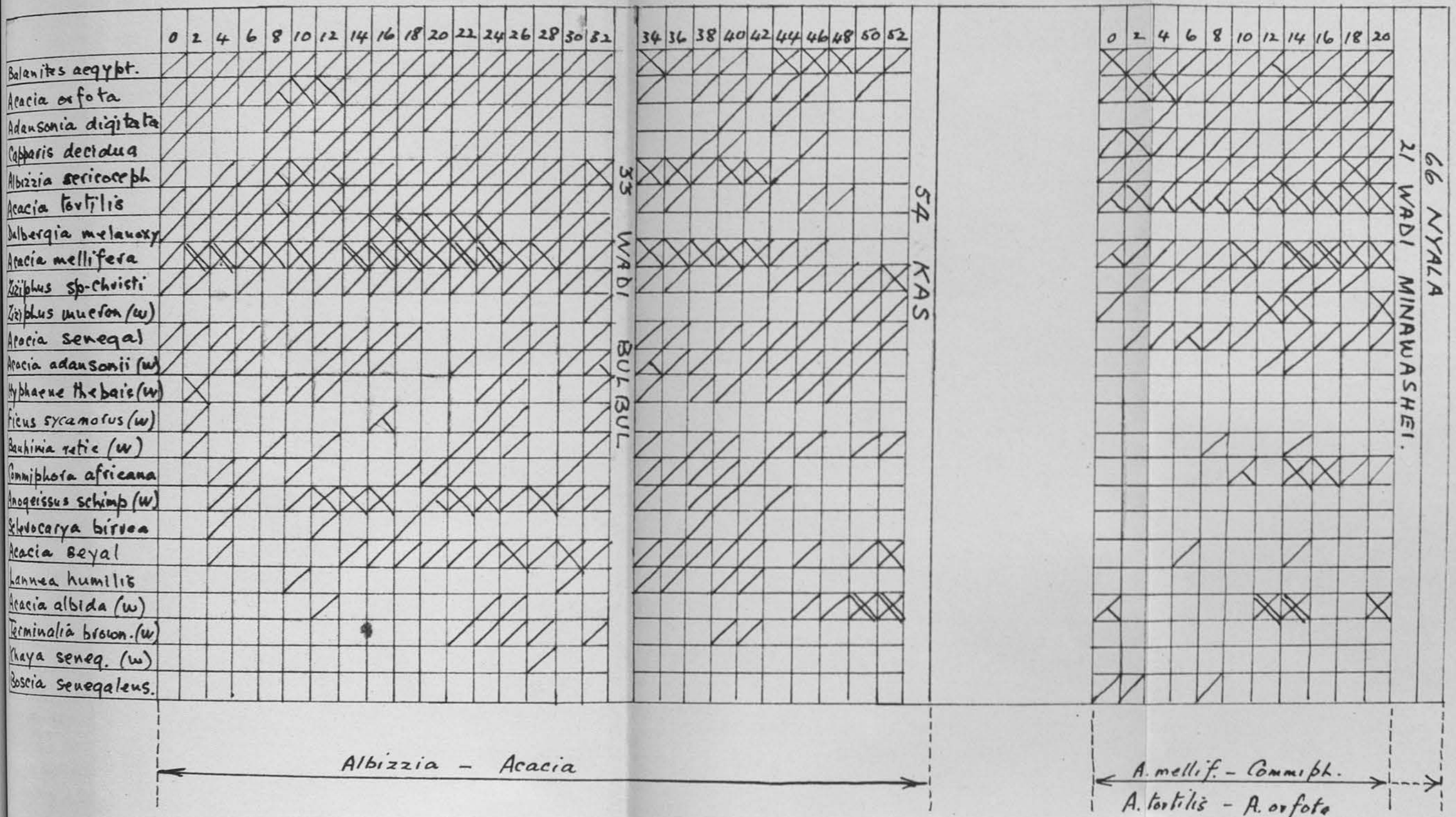


KEBKABIYA - ZALINGIE - KAS.

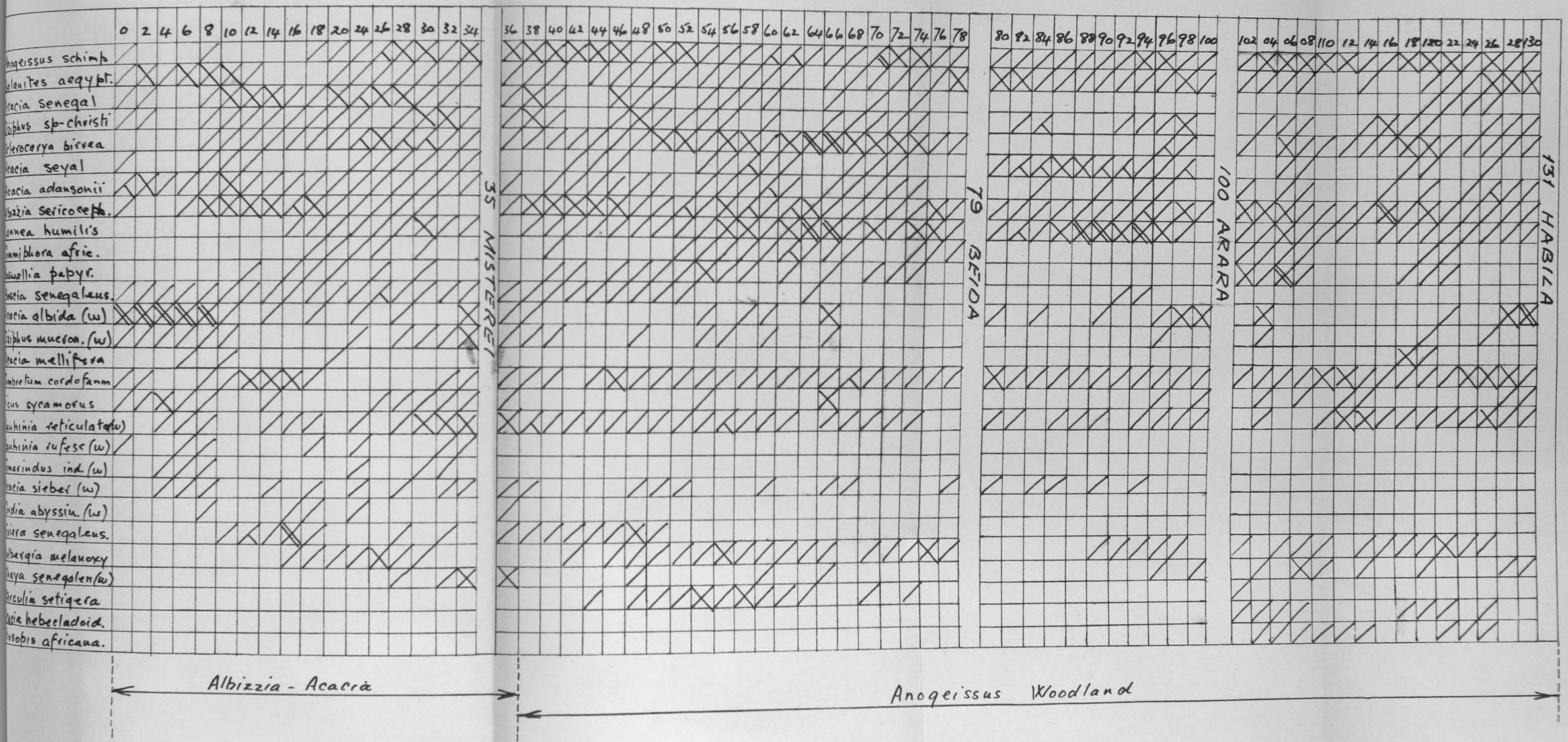


NYALA - KAS.

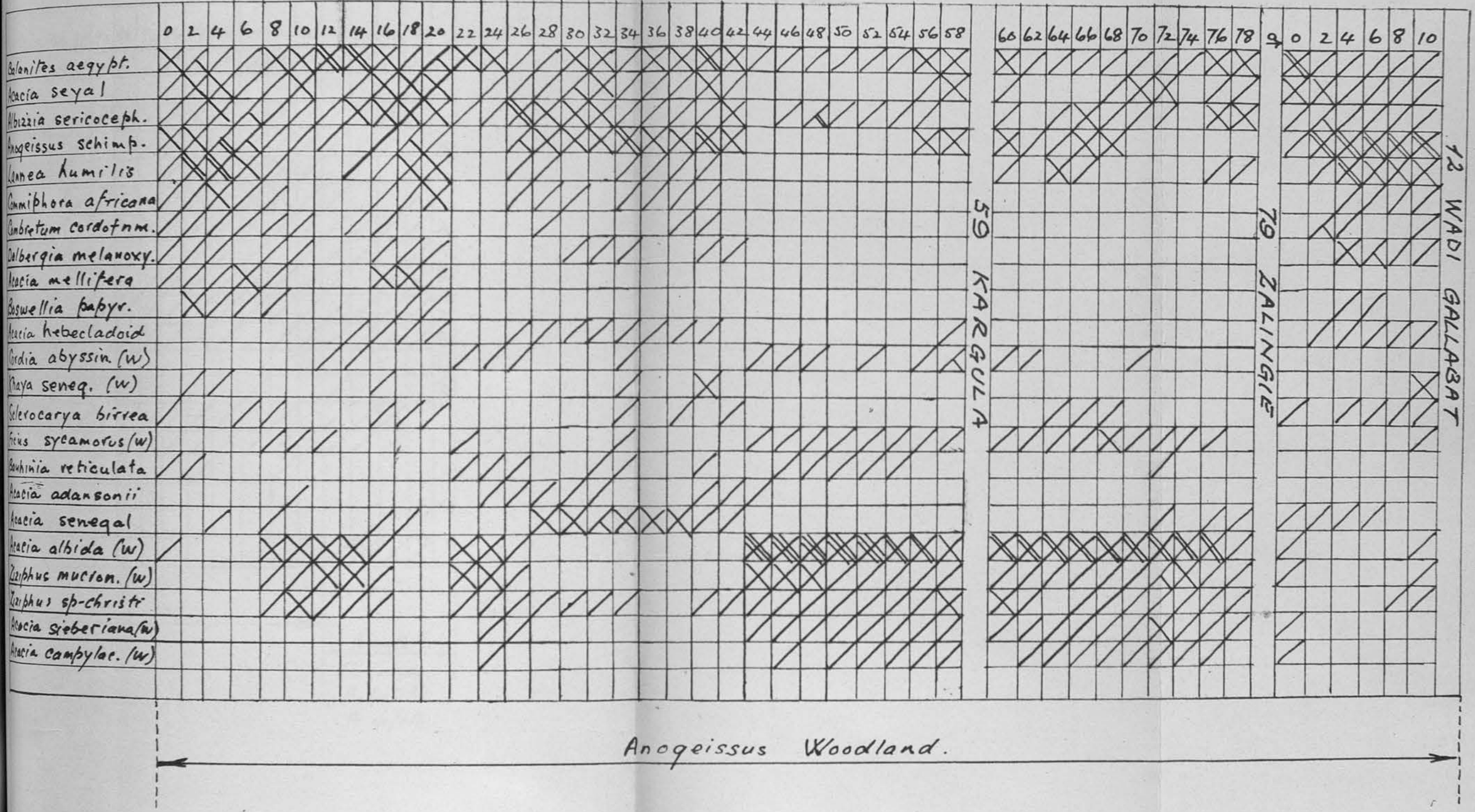
MELEMM - MINAWASHEI.



GENEINA - ARARA - HABILA.

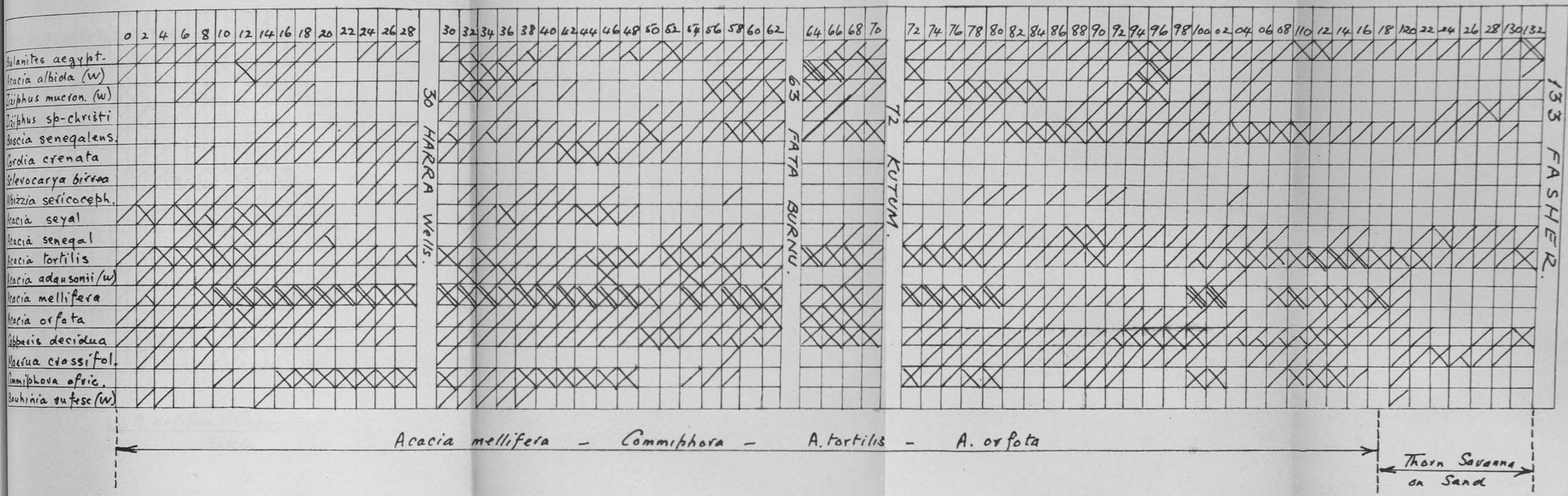


HABILA - ZALINGIE - WADI GALLABAT.

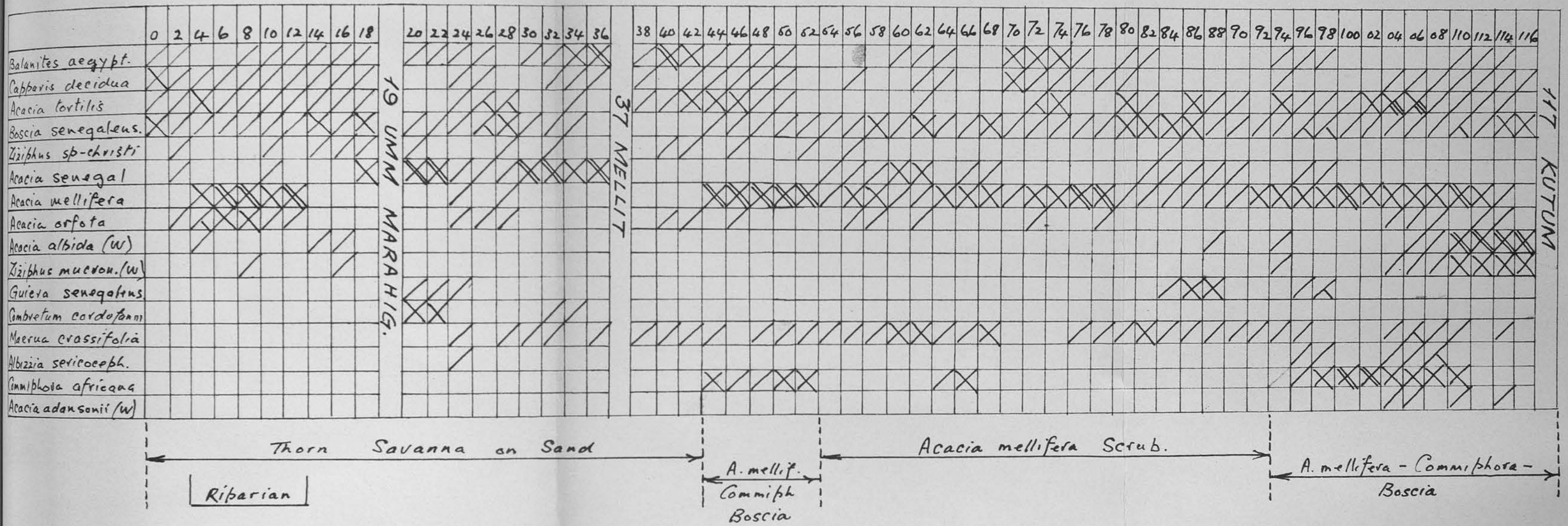


GENEINA - KEBKABIYA

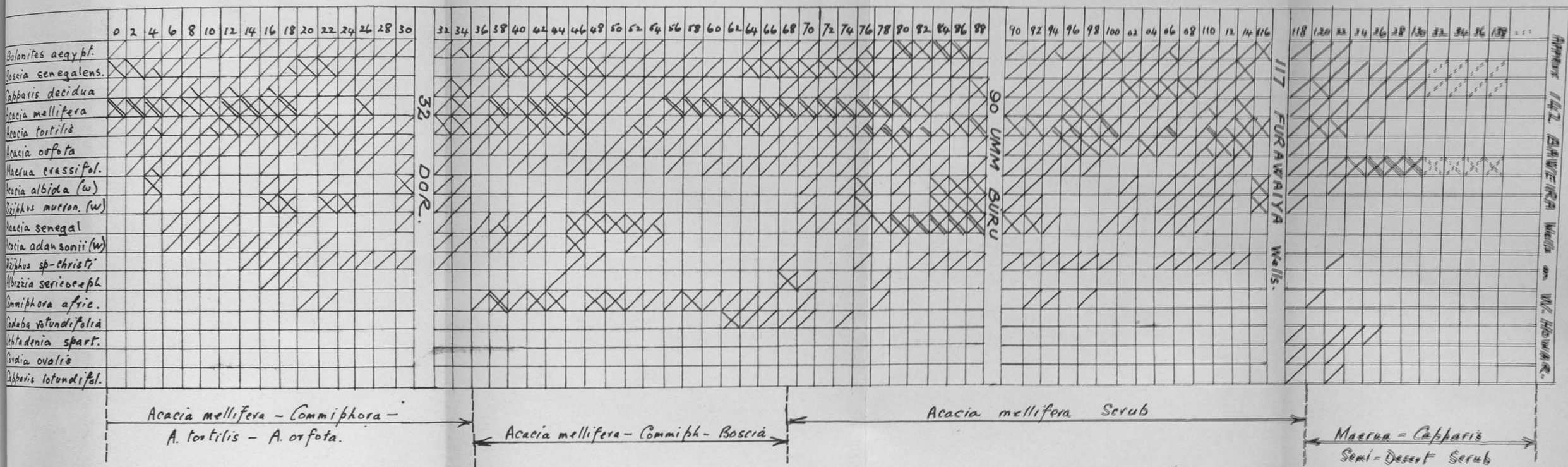
KEBKABIYA - KUTUM - FASHER.



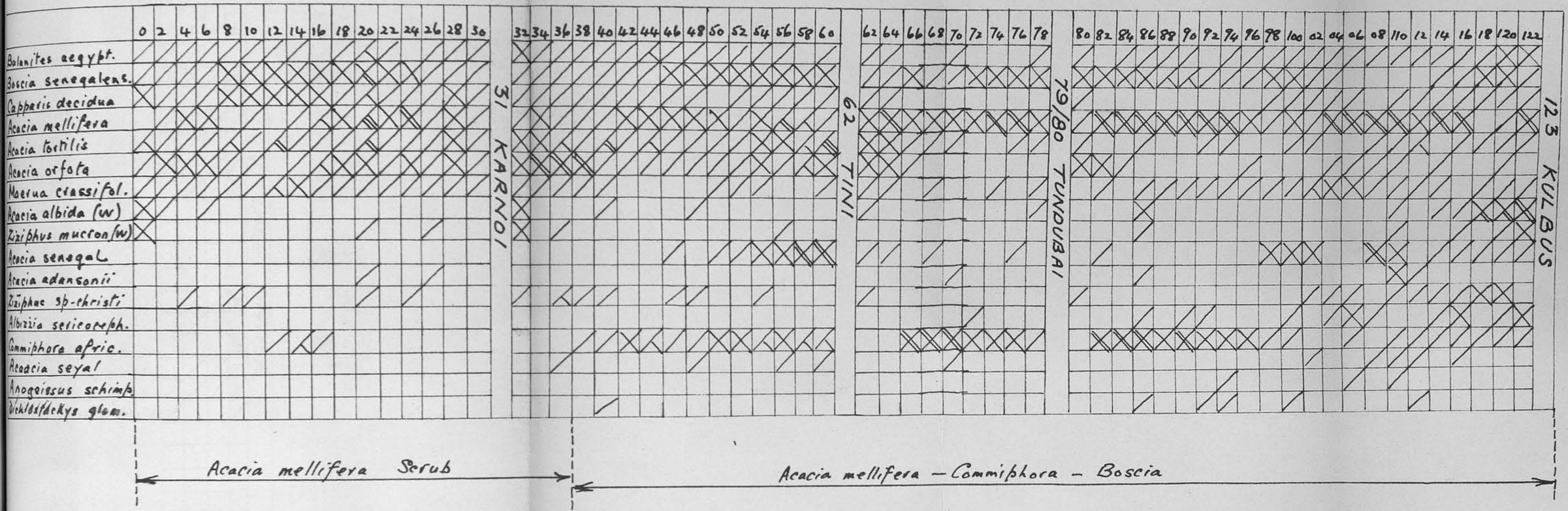
FASHER - MELLIT - KUTUM.



KUTUM - UMM BURU - FURAWAIYA - BAWEIRA.

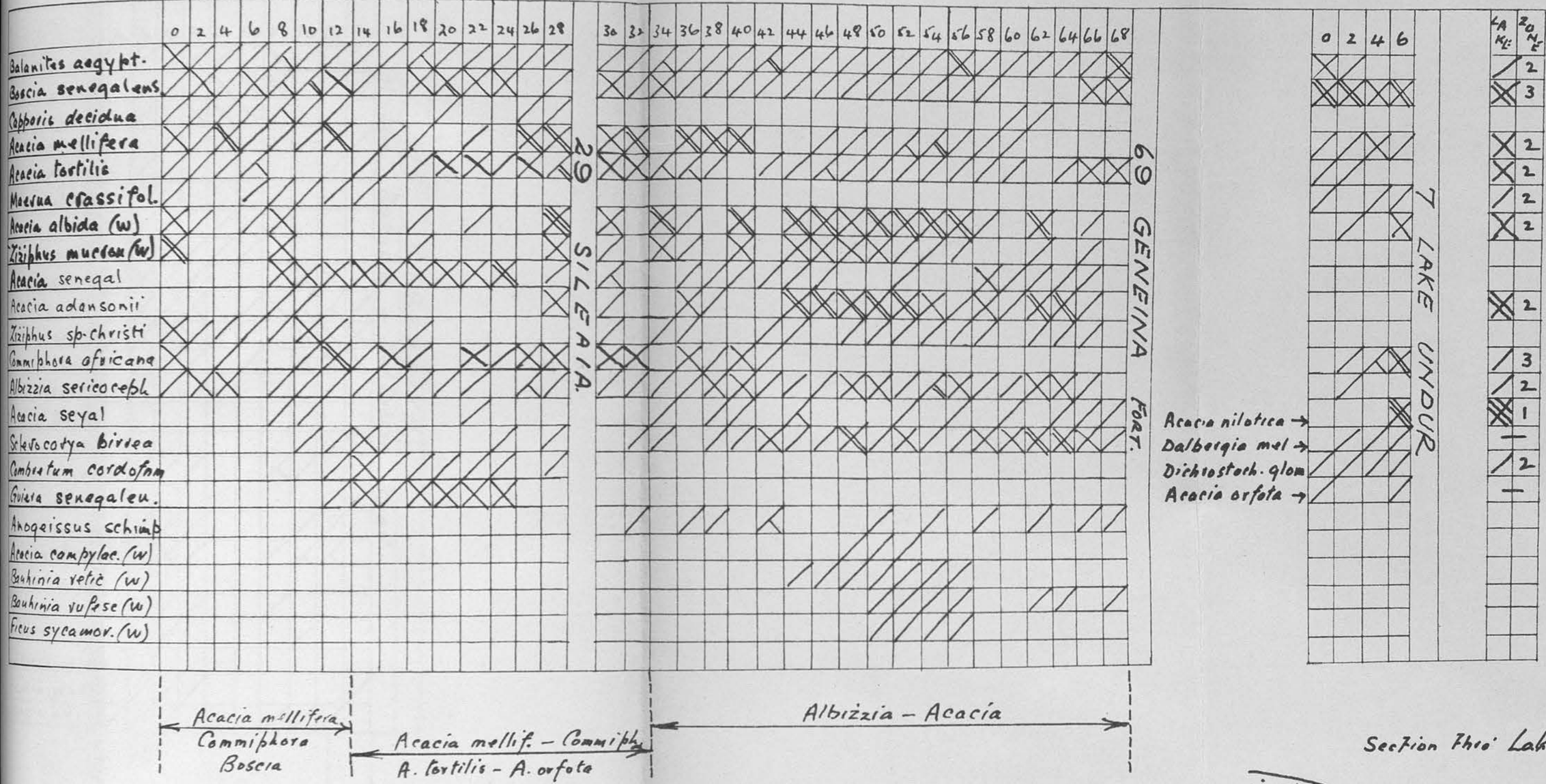


FURAWAIYA - TINI - KULBUS.

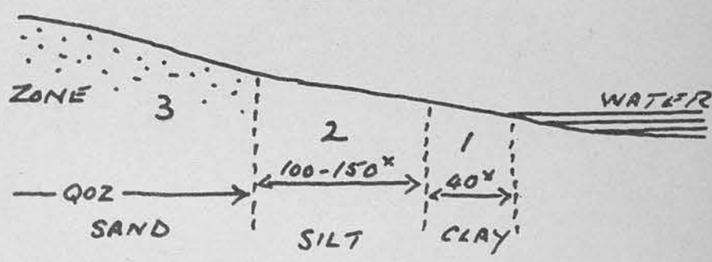


KULBUS – SILEAIA – GENEINA

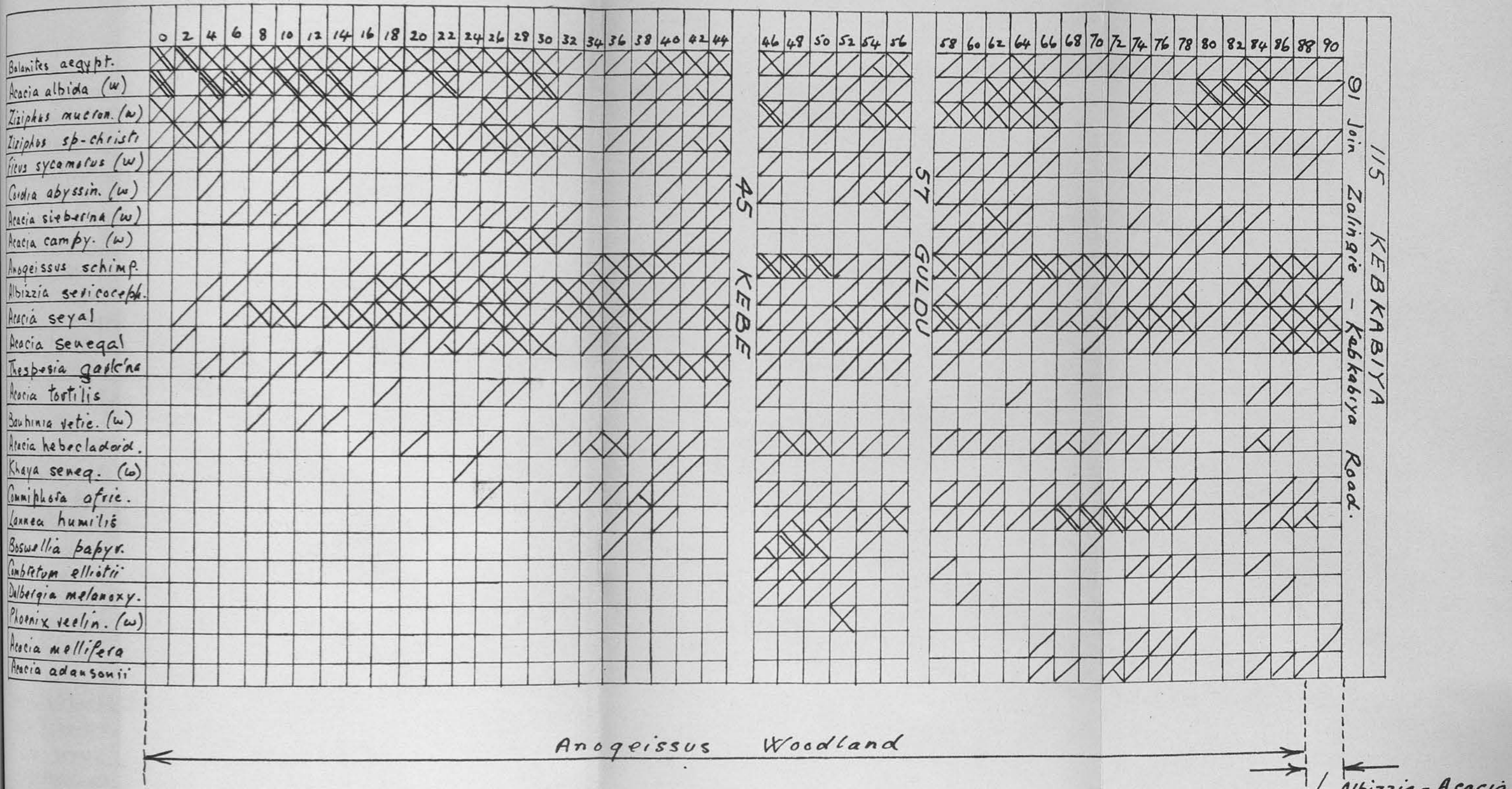
TUNDUBAI – LAKE UNDUR.



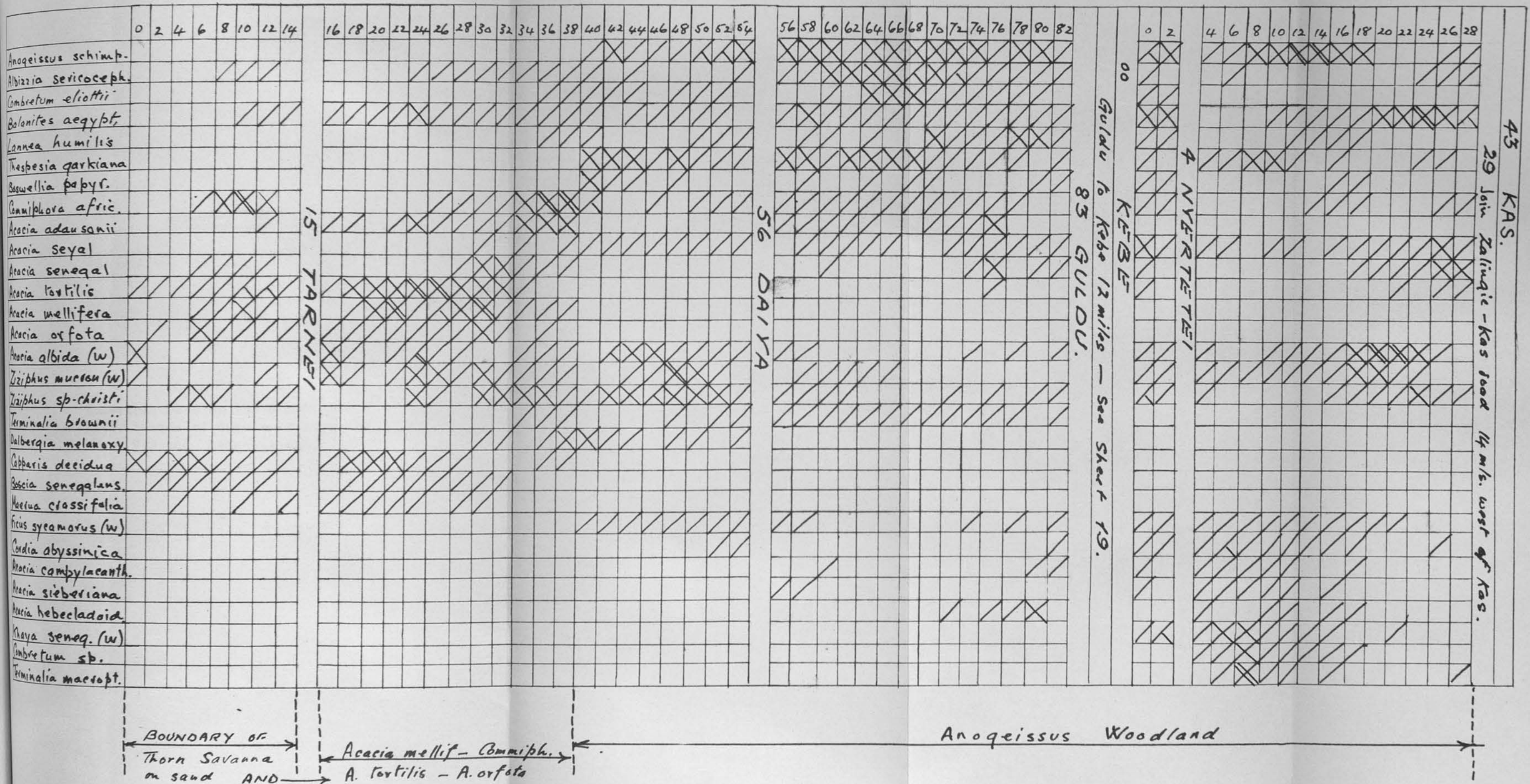
Section Thro' Lakeside.



ZALINGIE - KEBE - GULDU - KEBKABIYA.



TAWILLA - GŌLDU - KEBE - NYERTETEI - KAS.



APPENDIX IV.

Numerical Data on the Stocking and Distribution of Species within the Various Associations.

Acacia mellifera - A. orfota - Boscia
Scrub Association

of the

Thorn Savanna Formation.

Acacia mellifera - A. orfota - Boscia Scrub Association.

Distribution of Plots.

Mellit - Kutum

81, 82, 83.

Umm Buru - Furawaiya - Karnoi

(90), 91, (93), 94, 95.

Total 6.

NOTE: Throughout this appendix, a plot number given in parenthesis indicates that the plot falls within the geographical boundaries of the association under review as mapped, but that it is sited in a Riparian formation, and is hence excluded from consideration under the "country association".

Species Data from Plots.

Plot Nos.	81	82 *	83	91	94	95	Totals
Acacia mellifera	22	10		4	10	20	66
Boscia senegalensis	9	8	30	2	11	7	67
Acacia orfota	7			18	14	9	48
Maerua crassifolia			25		5	4	34
Acacia tortilis		12			13	5	30
Capparis decidua	5	6		1	5		17
Commiphora africana	2				2		4
Total main species	45	36	55	25	60	45	266
Maximum height	20	20	10	10	12	15	
Average height	8/10	8		5	9/10	9	
Total all species	62	36	60	25	60	45	288

* Figures for one half of the acre plot, doubled.

Acacia mellifera - A. orfota - Boscia Scrub

Summary of Data.

	TOTAL NO. EACH SPECIES IN ALL PLOTS	PERCENTAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND.	PERCENTAGE PLOTS IN WHICH FOUND
Boscia senegalensis	67	25.2	6	100
Acacia mellifera	66	24.8	5	83
Acacia orfota	48	18.0	4	67
Maerua crassifolia	34	12.8	3	50
Acacia tortilis	30	11.3	3	50
Capparis decidua	17	6.4	4	67
Commiphora africana	4	1.5	2	33
	225	100.0		

Stocking per acre main species .. .. .. 44.
Stocking per acre all species .. .. .. 48.
Main species comprise 91.5% of the total stocking.

Maximum height of crop .. .. 20' (6.0 M).
Average height of crop .. .. 8.1' (2.4 M).

Acacia mellifera - *Commiphora* - *Boscia* Association

of the

Thorn Savanna Formation

Acacia mellifera - Commiphora - Boscia Association

Distribution of Plots

Mellit - Kutum

(79), 80,

(83), 84, (85).

Kutum - Umm Buru

(87, 88, 89

Karnoi - Kulbus

(96, 97, (98) 99, (100),

101, 102, 103, 104

Total 12

Species Data from Plots.

Plot No.	80	84	87	88	89	96	97	99	101	102	103	104	Totals
Acacia mellifera	35	26	29		16	10	4	3	25	38	7	33	226
Commiphora africana	14	28	9				32	27	12	28	8	9	167
Boscia senegalensis	9	11	6	12	9	7	26	25	11	10		15	141
Acacia senegal				15			1				48		64
Acacia orfota	4					42					3	3	52
Acacia tortilis		2	11	2	8	12						11	46
Balanites aegyptiaca		1		2		1				1	5	5	15
Capparis decidua						6						5	11
Albizzia sericocephala										1		8	9
Total main species	62	68	55	31	33	78	63	55	48	78	71	89	731
Maximum height Average height	10	12 10	8/10	17	12 8/10	14 10/11	12 10	15 11	14 10	15 10/12	18 13	20 12/14	
Total All species	66	68	55	32	37	79	63	55	62	79	73	102	771

Acacia mellifera - Commiphora - Boscia Association

Summary of Data

	TOTAL NO. EACH SPECIES IN ALL PLOTS	PERCENTAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCENTAGE PLOTS IN WHICH FOUND
Acacia mellifera	226	30.9	11	92
Commiphora africana	167	22.8	9	75
Boscia senegalensis	141	19.3	11	92
Acacia senegal	64	8.8	3	25
Acacia orfota	52	7.1	4	33
Acacia tortilis	46	6.3	6	50
Balanites aegyptiaca	15	2.1	6	50
Capparis decidua	11	1.5	2	17
Albizzia sericocephala	9	1.2	2	17
	731	100.0		

Stocking per acre, main species 61

Stocking per acre, all species 64

Main species comprise 95% of all the species enumerated

Maximum height of crop .. .. 20' (6.0 M)

Average height of crop .. .. 10.6' (3.2 M)

Acacia mellifera - Commiphora - A. tortilis - A. orfota

Association

of the

Thorn Savanna Formation

Acacia mellifera - Commiphora - A. tortilis - A. orfota Assn.

Distribution of Plots.

Nyala - Mosku

14, 15, 16, 17, (18), 19, 20

Fasher - Kebkabiya

31, 5, 32, 33, 34, 35, 36, 37

Kebkabiya - Kutum

41, (42), 43,44, 45, 46, 47

Kutum - Fasher

48, 49, 50, 51

Mellit - Kutum - Umm Buru

85, 86

W. of Kebkabiya and S. of Kebkabiya

(37) 150

Fasher + 30 mls. - Melemm.

(160, 161, 162, (163).

S.W. of Melemm 164

S. of Melemm 171

Kulbus - Sileaia

(105, 106

Total 34.

Acacia mellifera - Commiphora - A. tortilis - A. orfota Association

Species Data from Plots

Plot Nos.	5	14	15	16	17	19	20	31	32	33	34	35	36	37	41	43	44	45	46	47	48	49	50	51	85	86	150	161	162	160	164	171	105	106	Totals
Acacia mellifera	5	7	7	29	13	21	101	36	52	50	82	68	111	6	35	24	17	3	25	29	2	30	13	5	31	23	43	34	35	19	57	22			1035
Commiphora africana		9	29		28	62		1		6	20	11			2	1	34		29	1	3		40	10	14		21	2	24		12	8	1		368
Acacia orfota	91	3	12	65	53		7	1	9		1	6			3	4	4	9	13	10			5		3	3			1	32	4	3			342
Acacia tortilis	24	4	12	29	1	12		4	6	2	2	2			1	18		19	6	38		8	2	19	7	20		25	4	1	3	4		19	292
Acacia senegal		9	10	30	3		8			1				88	11	2	1	6	3		2	8				2	6		7		11	14	45	21	288
Boscia senegalensis							6	32					16		4		9	4	16	29	17	10	14	5	8			1	5	16			7		199
Albizzia sericocephala		15	19	1		4					1			8	40	1		7			10						3	1	1			3	9		123
Balanites aegyptiaca	2	2	2	6					1		1	3	5	8		10		5	2	8	3						12	3					2	6	81
Capparis decidua	3			1				6	1	1	1			1				13		7	3	4			2	2			3	7	2	1			58
Acacia seyal				2						1	5	8		29		3		3									3							3	57
Acacia adansonii	8			13					1		1			7		12		10																	52
Total Main species	133	49	91	176	98	99	122	80	70	61	114	98	132	147	96	75	65	79	94	122	40	60	74	39	65	50	88	66	80	75	89	55	64	49	2895
Maximum height	16	17	20	20	18	15	12	15	11	11	16		15	25	13	19	14		15	26	19	25	20	17	12	20		21		16	17	24		20	
Average height	6/8	10	13/15	13	10	9/10	6/8	8/9	7	6/8	10	8/9	8	8/15	8/9	12	6	5	8	7/8	5/7	6	8/10	13/14	8/9	9/10	12	10	12	8	9	13	18	16	
Total All species	148	172	238	224	160	205	130	106	77	85	144	112	155	195	144	110	110	95	96	141	158	65	102	43	65	53	89	91	82	75	104	73	93	65	4005

Acacia mellifera - Commiphora - A. tortilis - A. orfota Association

Summary of Data

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Acacia mellifera	1035	35.8	32	94
Commiphora africana	368	12.7	23	68
Acacia orfota	342	11.8	23	68
Acacia tortilis	392	10.1	27	79
Acacia senegal	288	9.9	21	62
Boscia senegalensis	199	6.8	17	50
Albizzia sericocephala	123	4.2	15	44
Balanites aegyptiaca	81	2.8	18	53
Capparis decidua	58	2.0	17	50
Acacia seyal	57	2.0	9	26
Acacia adansonii	52	1.8	7	21
	2895	99.9		

Average stocking per acre, main species 85

Average stocking per acre, all species 114

Main species are 75% of all the species enumerated

Maximum height of crop .. .. .. 26' (7.8 M)

Average height of crop .. .. .. 9.8' (3.0 M)

Albizzia - Acacia Association

of the

Thorn Savanna Formation

(i) Western Variant
(ii) South-eastern Variant
(iii) Comparison
(iv) Combination of i and ii

Full Name:

Albizzia - Acacia mellifera - A. senegal - A. seyal

Association

Albizzia - Acacia Association

Western Variant

Distribution of Plots

Sileaia - Geneina

107, (108), 109

Geneina - Misterai

117, (118 - Sand Association)

Geneina - Kebkabiya

(110), (111), 112, 113, 114, (115), 116

40, 39, 38

Total 10

Albizzia - Acacia Association
Western Variant

Species Data from Plots.

	107	109	117	112	113	114	116	40	39	38	Totals
Acacia senegal	4		21	81	21	8	32	53	25	101	346
Acacia mellifera	39	31				40	27	27	10	30	204
Acacia seyal	10	11				5	21	32	45	18	142
Albizzia sericocephala	3	5	5	23	19	5	12	6	39	3	120
Boscia senegalensis		9	7	23	13						52
Acacia orfota						18		5		7	30
Acacia tortilis	12	12				2					26
Commiphora africana	26										26
Balanites aegyptiaca	4	3			4	7				7	25
Acacia adansonii		9	2					4	3	6	24
Capparis decidua						3	1				4
Dalbergia melanoxylon											NIL
Total No. Main species	98	80	35	127	57	88	93	127	122	172	999
Maximum height	25	25		14	16	20	20	18	22	18	
Average height	12	12	15	8	9	10	12	10	8	12	
Total No. all species	102	84	61	154	92	88	101	160	146	251	1239

Albizzia - Acacia Association
Western Variant

Summary of Data

	TOTAL NO. EACH SPECIES IN ALL PLOTS	PERCENTAGE OF TOTAL STOCKING	No. OF PLOTS IN WHICH FOUND	PERCENTAGE PLOTS IN WHICH FOUND
Acacia senegal	346	34.6	9	90
Acacia mellifera	204	20.4	7	70
Acacia seyal	142	14.2	7	70
Albizzia sericocephala	120	12.0	10	100
Boscia senegalensis	52	5.2	4	40
Acacia orfota	30	3.0	3	30
Acacia tortilis	26	2.6	3	30
Commiphora africana	26	2.6	1	10
Balanites aegyptiaca	25	2.5	5	50
Acacia adansonii	24	2.4	5	50
Capparis decidua	4	0.4	2	20
Dalbergia melanoxylon	-	-	-	-
	999	99.9		

Albizzia - Acacia Association
South - eastern Variant

Distribution of Plots.

Nyala - Kas + 12 mls.

132, 133, 134, 135, 136, 137, 138

Nyala - Kidingir - Keila minus 10 mls.

165, 166, 167, 168, 169, 170

Total 13

Albizzia - Acacia Association

Species Data from Plots.

	132	133	134	135	136	137	138	165	166	167	168	169	170	Totals
Acacia mellifera	15	43	24	35				30	18	9	38	6	18	236
Acacia senegal	14		1	25	7	22	6	8	23	41	22	47		216
Albizzia sericocephala	15	19	9	34	16	16		19	14	7	15	13	21	198
Acacia seyal		8	20	25	20	18	22	2		8	10	4		137
Acacia orfota	3		5	8	9				6	25	53	18	3	130
Balanites aegyptiaca	1		6		27	12	29	1	5	3	19			103
Acacia tortilis	5	19	18	9	5	18		7				8	11	100
Dalbergia melanoxylon		20				13				6			14	53
Commiphora africana								15					22	37
Acacia adansonii			27											27
Capparis decidua		3	5	4						2				14
Boscia senegalensis									2					2
Total Main species	53	112	115	140	84	99	57	82	68	101	157	96	89	1253
Maximum height		18	35				24	21	18	22	20	18	18	
Average height	12	14	15	18	20	13	10/12	10	12	13	13	10	10	
Total all species	74	124	128	152	133	121	96	82	83	113	183	115	121	1525

Albizzia - Acacia Association

South - eastern Variant.

Summary of Data.

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Acacia mellifera	236	18.9	10	77
Acacia senegal	216	17.3	11	85
Albizzia sericocephala	198	15.8	12	92
Acacia seyal	137	10.6	10	77
Acacia orfota	130	10.4	9	69
Balanites aegyptiaca	103	8.2	9	69
Acacia tortilis	100	8.0	9	69
Dalbergia melanoxylon	53	4.2	4	31
Commiphora africana	37	3.0	2	15
Acacia adansonii	27	2.2	1	8
Capparis decidua	14	1.1	4	31
Boscia senegalensis	2	0.2	1	8
	1253	99.9		

(iii) Comparison of the Western and South-eastern Variants of the Albizzia - Acacia Association

	PERCENTAGE OF TOTAL STOCKING EACH SPECIES, ALL PLOTS		PERCENTAGE OF PLOTS IN WHICH EACH SPECIES FOUND	
	W	SE	W	SE
lbizzia sericocephala	12,0	15.8	100	92
acia senegal	34.6	17.3	90	85
acia mellifera	20.4	18.9	70	77
acia seyal	14.2	10.6	70	77
Four Main species, total percentage	81.2	62.6		
acia orfota	3.0	10.4	30	69
acia tortilis	2.6	8.0	30	69
alanites aegyptiaca	2.5	8.2	50	69
oscia senegalensis	5.2	0.2	40	8
ommiphora africana	2.6	3.0	10	15
acia adansonii	2.4	2.2	50	8
apparis decidua	0.4	1.1	20	31
albergia melanoxylon	-	4.2	-	31
	99.9	99.9		

(iv) Combination of the two Variants

	TOTAL NO. EACH SPECIES IN ALL PLOTS			OVERALL PERCENTAGE OF TOTAL STOCKING	TOTAL NO. OF PLOTS IN WHICH FOUND			OVERALL PERCENTAGE OF PLOTS IN WHICH FOUND
	W	SE	Total		W	SE	Total	
Albizzia sericocephala	120	198	318	14.1	10	12	22	96
Acacia senegal	346	216	562	24.9	9	11	20	87
Acacia mellifera	204	236	440	19.5	7	10	17	74
Acacia seyal	142	137	279	12.4	7	10	17	74
Acacia orfota	30	130	160	7.1	3	9	12	52
Balanites aegyptiaca	25	103	128	5.7	5	9	14	61
Acacia tortilis	26	100	126	5.6	3	9	12	52
Commiphora africana	26	37	63	2.8	1	2	3	13
Acacia adansonii	24	27	51	2.3	5	1	6	26
Boscia senegalensis	52	2	54	2.4	4	1	5	22
Capparis decidua	4	14	18	0.8	2	4	6	26
Dalbergia melanoxylon	-	53	53	2.4	-	4	4	17
	999	1253	2252	100.0				

Average stocking per acre, main species 98
Average stockingper acre, all species 120

Main species comprise 82% of all the species enumerated

Maximum height of crop 25' to 35' (7.5 - 10.5 M)
Average height of crop 12' (3.6 M)

Anogeissus Woodland

Anogeissus - Acacia seyal - Lannea - Albizzia

Association

of the

Savanna Woodland Formation

Anogeissus Woodland

Distribution of Plots

Geneina + 40 mls. - Arara - Habila - Zalingei

119, 120, 121, 123, 124, 125, (126),
127, 128, (129), 130, 131, 122

Zalingei - Kebe - Guldu - Kebkabiya road

(144), 145, 146, 147, 148, 149

Kebkabiya + 30 mls. - Zalingei

152, 153, (154), 155, 156, 157

Kas + 12 mls. - Zalingei

(138), 139, (140), 141, (142), 143

Total 24

Anogeissus Woodland

Species Data from Plots

Plot Nos.	119	120	121	122	123	124	125	127	128	130	131	145	146	147	148	149	152	153	155	156	157	139	141	143	Totals
Anogeissus schimperi			2		5	21	8			13	58	27	36	326	57	21	49	12	3	6		15		13	672
Acacia seyal	4		20	13	11		9	7	16	6	5	43	34	24	55	62	7	18		14	9		17		374
Lannea humilis	11	11	13	17	13	5	28	12	4		33		1	2	35	73	32			15		12		6	323
Albizzia sericocephala	5	15	3	7	4	19	18	29	8	16	8	6	5	18	11	13	1	4			2	2	10	6	210
Acacia senegal	6								7			34	3		4	13	7	6					48	17	145
Boswellia papyrifera	3				42		1							28						7		26			107
Balanites aegyptiaca	3		14	3			1		6		1	6					5	6		7	21	1	16	7	97
Commiphora africana	11	12			4	3	2	5	6		4		7		7	3				17		9		5	95
Dalbergia melanoxylon	7	13		5	4	15	4				13											5			66
Acacia adansonii	4				1	4		6	9								4	3							31
Sclerocarya birrea		8			2	6				1	1											1		1	20
Acacia hebecladoides					1			2				3	2			1		1							10
Total Main Species	54	59	52	45	87	73	71	61	56	36	123	119	88	398	169	186	105	50	3	66	32	71	91	55	2150
Maximum height	26		30	18		25		23	25	24	26	25	30	28	30	24	20	24	25	24	35	24		25	
Average height	18	18	20	15	18	20	18	16	16	18	18/20	18	18	18	18	16	12/15	17	16	18		18/20	25	18	
Total All species	56	71	63	66	87	73	78	78	63	61	132	119	144	524	170	189	122	68	62	76	38	86	110	83	2619

Anogeissus Woodland

Summary of Data

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Anogeissus schimperi	672	31.3	17	71
Acacia seyal	374	17.4	19	79
Lannea humilis	323	15.0	18	75
Albizzia sericocephala	210	9.7	22	92
Acacia senegal	145	6.7	10	42
Boswellia papyrifera	107	5.0	6	25
Balanites aegyptiaca	97	4.5	14	58
Commiphora africana	95	4.4	14	58
Dalbergia melanoxylon	66	3.1	8	33
Acacia adansonii	31	1.4	7	29
Sclerocarya birrea	20	0.9	7	29
Acacia hebecladoides	10	0.5	6	25
	2150	99.9		

Average stocking per acre, main species 90
Average stocking per acre, all species 109

Main species comprise 82.5% of all the species enumerated.

Maximum height of stand .. .. 35' (10.5 M)
Average height of tree crop . .. . 25' (7.5 M)

Thorn Savanna on Sand

Acacia senegal - *Balanites* - *Guiera* Association

of the

Thorn Savanna Formation

Thorn Savanna on Sand

Distribution of Plots

Mallit - Fasher

79, 78, 77

Kutum - Fasher

(52), 53

Fasher - Tawilla

(6), 28, 29, (4)

Fasher - Tarnei

158, 159, (160)

Fasher - Mosku

7, (27), (26), 25, 24, (23), (22), (21)

Nyala - Mahugeria

(8), 9, 10, 11, (12), (13)

Mahugeria - Wada'a

76, 75, 74, (73), (72), (71)

Total 17

Thorn Savanna on Sand

Species Data from Plots

	77	78	79	53	28	29	25	24	9	10	11	74	75	76	158	159	7	Totals
Acacia senegal	18	21	18	1			6	12	10	4		17	25	22	1	9	47	211
Guiera senegalensis	3			3						1	52	31		17	20			127
Balanites aegyptiaca	4	8	10		1			40	4	11	6	1	18	13		1		117
Boscia senegalensis	3	5		30	5		45	3				3	7			5		106
Ziziphus spina-christi			8		5		3			15				7	6	8		52
Acacia orfota			9		2	1	35	1										48
Acacia tortilis					9	1	18	5	6	4								43
Maerua crassifolia			4	25														29
Combretum cordofanum	2										10							12
Total Main Species	30	34	49	59	22	2	107	61	20	35	68	52	50	59	27	23	47	745
Maximum Height	20	23	25	5	6			26	20	25	22	18	25		9	22	18	
Average height			8			2	8/9	15/20	15	15/20			15/18	18	7		7	
Total All species	30	37	49	60	44	6	113	62	84	119	79	56	64	66	27	28	50	1074

Thorn Savanna on Sand

Summary of Data

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Acacia senegal	211	28.2	14	82
Guiera senegalensis	127	17.1	7	41
Balanites aegyptiaca	117	15.7	12	71
Boscia senegalensis	106	14.2	9	53
Ziziphus spina-christi	52	7.0	7	41
Acacia orfota	48	6.5	5	30
Acacia tortilis	43	5.8	6	35
Maerua crassifolia	29	3.8	2	12
Combretum cordofanum	12	1.6	2	12
	745	99.9		

Average stocking per acre, main species 44

Average stocking per acre, all species 63

Main species comprise 70% of all the species enumerated

Maximum height of stand .. .. 26 ' (7.8 M)

Average height of stand .. .. 11.7' (3.5 M)

Woodland on Sand

Acacia senegal - *Combretum* - *Guiera* - *Lannea*

Association

of the

Savanna Woodland Formation

Woodland on Sand

Distribution of Plots

Umm Kedada - Heskanita

55, 56, 57, 58, 59, 60, 61, 62

Taweisha - Wada'a

63, 64, 65, (66), 67, 68, 69, 70

Total 15

Woodland on Sand

Species Data from Plots

	55	56	57	58	59	60	61	62	63	64	65	67	68	69	70	Totals
Acacia senegal		1	75	2	7	2	20	5	11	3	5	23	20	19	21	214
Combretum cordofanum	4	1	12	20	14	27	27	15	14	11	5	13	6	10	5	184
Guiera senegalensis		3	3	20	19	18	14	8	10	22	12	9	3	11	9	161
Lannea humilis		26		47	16	6				7		6				108
Boscia senegalensis	9	5	10	9	6	4	10			14	8	3				78
Balanites aegyptiaca			5	4	4	2			17			7	9	7	12	67
Commiphora africana	47	12				3						1				63
Maerua crassifolia	3	2	3						4		2		7	6	7	34
Sclerocarya birrea	4	1		1			1				1		1			9
Terminalia macroptera						2		2		4			1			9
Stereospermum kunthianum						1		2								3
Total Main Species	67	51	108	103	66 (40)	65	74	30	56	61	33	62	47	53	54	930
Maximum height	25	25	25	30	20	30	25	25	30	28	20	22	27	18	20	
Average height	8	10/12	5	15	7	20		20	15/20	15/20	16	14	16	14	13	
Total All Species	73	62	112	106	74	68	83	44	63	67	39	62	48	56	57	1014

Woodland on Sand

Summary of Data

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Acacia senegal	214	23.0	14	93
Combretum cordofanum	184	19.8	15	100
Guiera senegalensis	161	17.3	14	93
Lannea humilis	108	11.6	6	40
Boscia senegalensis	78	8.4	10	67
Balanites aegyptiaca	67	7.2	9	60
Commiphora africana	63	6.8	4	27
Maerua crassifolia	34	3.6	8	53
Sclerocarya birrea	9	1.0	6	40
Stereospermum kunthianum	3	0.3	2	13
	930	100.0		

Average stocking per acre, main species 62

Average stocking per acre, all species 67

Main species comprise 92% of all the species enumerated

Maximum height of crop 30' (9.0 M)

Average height of tree layer 18' - 20' (5.4 - 6 M)

Average height of shrub layer 6' (.8 M)

Riparian Thornland

Acacia mellifera - *Boscia* - *A. orfota* - *Balanites* Association

Riparian Thornland

Distribution of Plots

Fasher - Tawilla - Tini

6, 30, 1

Fasher - Mosku

21, 22, 23, 26, 27

Nyala - Mahugeria

8, 12, 13

Mahugeria - Wada'a

71, 72, 73

Taweisha - Wada'a

66

Kebkabiya - Kutum - Fasher

42, 52

Geneina - Kebkabiya

111

Total 18

Riparian Thornland

Species Data from Plots

Plot Nos.	6 *	111 *	1	8 *	12	13	21 *	22	23	26	27	30	42	52	66	71	72	73	Totals
Acacia mellifera			80	20	41	25	60	135	6	41	2		69	5	50	63	27	27	651
Boscia senegalensis							56	22	9	10		1	71	31		7		7	214
Acacia orfota			14	6	37	16	26	67	8		9	1			7		17		208
Balanites aegyptiaca			9	8	42	2	2	12	37	15			9		9	6		7	158
Capparis decidua		8	8				30	6		13	20	18				4	5		104
Acacia tortilis				12	1		2	1	20		1	2	2	33			11	8	93
Ziziphus spina-christi					6				5	26		1	10		3				51
Acacia seyal				32	1	5									10		3		51
Anogeissus schimperi				26									3						29
Dichrostachys glomerata				2	11	6	2							6					27
Acacia adansonii	4800	1380		2		2				4			1	6					15
Acacia albida	40																		NIL
Total Main Species	4840	1388	111	108	139	56	178	243	85	109	32	23	165	81	79	80	63	49	1601
Maximum height	8			30	25		20	20	12	25	9		30	28	27	23		25	
Average height	5½	4	11	18/20	17	15	10	6	6		5/6	7	12/13	9/10	9/12	8/9	8/9	9	
Total All species	5160	1388	111	268	168	100	228	261	114	134	35	23	211	122	101	86	71	55	2088

6 & 111 are plots in young natural regeneration. Exclude from calculations.

NOTE: * These plots are less than 1 acre. The figures given in the table are the calculated stockings per acre.

Riparian Thornland

Summary of Data

	TOTAL NO.EACH SPECIES IN ALL PLOTS	PERCEN-TAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCEN-TAGE PLOTS IN WHICH FOUND
Acacia mellifera	651	40.7	15	94
Boscia senegalensis	214	13.4	9	56
Acacia orfota	208	13.0	11	69
Balanites aegyptiaca	158	9.9	12	75
Capparis decidua	104	6.5	8	50
Acacia tortilis	93	5.8	11	69
Ziziphus spina-christi	51	3.2	6	38
Acacia seyal	51	3.2	5	31
Anogeissus schimperi	29	1.8	2	13
Dichrostachys glomerata	27	1.7	5	31
Acacia adansonii	15	0.9	5	31
Acacia albida	-	-		
	1601	100.1		

Average stocking per acre, main species 100

Average stocking per acre, all species 131

Main species comprise 77% of all the species enumerated.

Maximum height of crop .. .. .. 30' (9.0 M)

Average height of crop .. .. .. 10.9' (3.3 M)

Riparian Thorn Forest

Acacia albida - Acacia tortilis - Ziziphus mucronata Association

Riparian Thorn Forest

Distribution of Plots

Tini (Tawilla)

2, 3

Nyala - Mosku

18

Umm Buru - Furawaiya - W. Tini - Lake Undur

90, 93 98 100

Silcaia - Geneina - Kebkabiya

108, 110, 115

Geneina south to Zalingei

126, 129

Kas - Zalingei - Kebe

140, 142, 144

Kebkabiya - Zalingei

151, 154

Fasher - Melemm

163

Total 18

Riparian Thorn Forest

Species Data from Plots

Plot Nos.	2	3	18*	90	93	98	100	108	110	115	126	129	140	142	144	151*	154	163	Totals
Acacia albida	1	13	28	10	2	3	4	18	5	7	16	4	4	3	6	50	3	11	188
Acacia tortilis	11	5	152	3	26	10		3	4							34		8	256
Ziziphus mucronata			40	4	3	2		11	3	16	4	1			5	34	37	2	162
Balanites aegyptiaca	2		16	8	45	12	3	7	3					5	7	32	13	3	156
Ziziphus spina-christi		35	2			2			5			13	13	12	27	26		21	156
Acacia seyal						15	5		6		2			8	11	26	16	2	91
Acacia mellifera	36		10			6	3			4									59
Boscia senegalensis	17	3					11		18										49
Acacia adansonii	2	3	6			7	7	8	11									3	47
Albizzia sericocephala	1		20					7		5	1		4	2				2	42
Bauhinia rufescens		2	18						5									7	32
Bauhinia reticulata			4					5			2	1	4					5	21
Acacia sieberiana			2					1		5		3	1	4	1				17
Acacia nilotica							15												15
Anogeissus schimperi									5	4									9
Acacia campylacantha								2		1		2		1					6
Total Main Species	70	61	298	25	76	57	48	62	65	42	25	24	26	35	57	202	69	64	1306
Maximum height	40	45	45	40	35/40	45	35	45	30	45	40	45	45	40	30/45	30	35	40	
Average height										30	35	37		25/30		16	20/25	35	
Total All species	165	63	408	25	78	81	58	79	65	52	27	24	81	55	62	264	69	79	1735

NOTE: * These plots are less than 1 acre. The figures given in the table are the calculated stockings per acre.

Riparian Thorn Forest

Summary of Data

	TOTAL NO. EACH SPECIES IN ALL PLOTS	PERCENTAGE OF TOTAL STOCKING	NO. OF PLOTS IN WHICH FOUND	PERCENTAGE PLOTS IN WHICH FOUND
Acacia tortilis	256	19.7	10	56
Acacia albida	188	14.4	18	100
Ziziphus mucronata	162	12.4	13	72
Balanites aegyptiaca	156	12.0	13	72
Ziziphus spina-christi	156	12.0	10	56
Acacia seyal	91	7.0	9	50
Acacia mellifera	59	4.5	5	28
Boscia senegalensis	49	3.7	4	22
Acacia adansonii	47	3.6	8	44
Albizzia sericocephala	42	3.2	8	44
Bauhinia rufescens	32	2.4	4	22
Bauhinia reticulata	21	1.6	6	33
Acacia sieberiana	17	1.3	7	39
Acacia nilotica	15	1.1	1	6
Anogeissus schimperi	9	0.7	2	11
Acacia campylacantha	6	0.4	4	22
	1306	100.0		

Average stocking per acre, main species 73

Average stocking per acre, all species 96

Main species comprise 76% of all the species enumerated

Average overall height of stand .. .. 39.7' (11.9 M)

Pages 1 to 2, plus
Plots 1 to 171.

APPENDIX V.

VEGETATION ENUMERATION PLOTS.

APPENDIX V.

METHOD of PRESENTATION.

Each of the 171 enumeration plots which follow occupies a two page proforma.

On the left-hand page is the stocking data for each species recorded in the plot. In general the data is from a one acre plot, and represents a 100% enumeration of the woody species. Booking is by two-inch diameter classes from 0" to 24" and one class of over 24". The species are listed downwards in the table in order of decreasing numerical occurrence. Tree species are listed first, then shrub species. With regard to this it should be noted that there are certain species which are recorded as trees in one plot and as shrubs in another plot. Ziziphus spina-christi is a case in point. The general rule followed has been to list as a tree when the species forms part of the main crop, or approaches the general level of height growth of the plot as a whole; and to list as a shrub when it is definitely a member of the under-storey.

Another point concerns the booking of Acacia mellifera and A. orfota. These two species typically have a shrub habit, dividing at ground level into a number of stems which form the crown. After a number of trials and measurements the writer decided to recognise three size classes of bush, the following being the limiting dimensions of each class:

Symbol

SB	Small Bush:	Under 5' high, and less than 6' maximum crown diameter.
MB	Medium Bush:	Between 5' and 10' high, and between 6' and 12' maximum crown diameter.
LB	Large Bush:	Over 10' high, and over 12' maximum crown diameter.

In/

In certain cases Acacia mellifera grows in the habit of a tree, particularly is this so in closed riparian growth. In these cases where a single bole is developed, booking was in 2" diameter classes as for a tree.

On the right-hand page of the proforma is given the position and major environmental factors of the site, plus details of the stocking and height of the vegetation. The following brief notes refer to some of these entries.

Altitude was determined by means of an anaeroid altimeter, up to and including plot 54. Thereafter interpolation between spot heights on the 4 miles to an inch series of topographical maps was the method employed. This method is probably more accurate than the use of an altimeter, the daily checking of which is not possible on trek.

Rainfall figures have been interpolated from the writer's map of the isohyets.

In the final section on grass and herbs the symbol (H) before a species indicates that it is a herb. In the case of grasses the list indicates the main grasses present only. In many cases it will be noted that determinations go no lower than the genus in many cases. This is because in the dry season the grass heads become broken, and diagnostic features mutilated or lost, so that it is frequently impossible to get down to the species. Similarly, late on in the dry season it not infrequently happens that only a few genera even can be identified from out of the broken hay present on the ground.

F O R E S T V E G E T A T I O N

E N U M E R A T I O N S H E E T S,

Nos. 1 to 171 consecutively.

VEGETATION ENUMERATION PLOT No. 1.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	5	MB	44	LB	29								80
Acacia orfota	SB	3	MB	9	LB	2								14
Balanites aegyptiaca	-	2	7											9
Capparis decidua	6	2												8
														111

VEGETATION ENUMERATION PLOT No. 1.

ASSOCIATION: Riparian Thornland.

POSITION: 4 miles due West of Melemm on Keila road.
South side flood-plain of the Wadi Keila.

SIZE: 70 x 70 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 440 mm.

ASPECT & CONFIGURATION: Exposed. Level silt plain.

SOIL: Dark brown silt of alluvial origin, on the side flood-plain of the Wadi Keila - that is the middle reach of a mountain stream.
The profile shows much mica.
There is a slight surface cracking.
A deep, well-drained soil.

CANOPY & STOCKING: Locally closed in thorn thicket.
Otherwise open.

HEIGHT & FORM: Average 11'.

USE: Nil. Could be used for tobacco cultivation.

GRASSES & HERBS: Aristida sp.
Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 2.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	19	4	4	3	3	2	1							36
Commiphora africana	8	10	7	4	3	1								33
Acacia tortilis	2	4	2	2	1									11
Tamarindus indica	-	-	-	1	1	2	-	-	-	-	-		3	7
Capparis tomentosa	-	2	1											3
Balanites aegyptiaca	1	-	-	1										2
Acacia adansonii	-	-	-	-	-	1	-	-	-	-	-	-	1	2
Terminalia brownii	-	-	-	-	1	-	1							2
Acacia albida	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Albizzia sericocephala	-	-	-	1										1
Albizzia anthelmintica	6	1	5	4	4	2								22
Boscia senegalensis	7	7	3											17
Cissus quadrangulus	15													15
Combretum aculeatum	6													6
Grewia tenax	5													5
Grewia villosa	1													1
														165

VEGETATION ENUMERATION PLOT No. 2.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 5 miles SW of Tawilla, on the west bank of the Wadi Tini.

SIZE: 220 x 22 yds = 1 acre.

ALTITUDE: 2500'.

RAINFALL: 330 mm.

ASPECT & CONFIGURATION: Runs north and south along the steep west bank of the Wadi Tini. 20' high in places. Sheltered to the east. Exposed to the west.

SOIL: At the wadi edge in the east a sandy alluvium, light-brown to mid-brown in colour, coarse texture. Free draining.

At the top of the wadi bank a sedentary grit-soil plain stretches to the west. A thin, poor, stony soil developed from basement complex granites - which are exposed on the wadi bank cliffs.

CANOPY & STOCKING: Generally open to very open. Approaches closure locally along the narrow strip fringing the actual wadi.

HEIGHT & FORM: Maximum 40' (Tamarindus).
Average of the thorn scrub 12'.

USE: Nil.

GRASSES & HERBS:

Aristida sp. Chloris pilosa Eragrostis tremula	On the basement complex grit plateau.
Echinochloa colona Andropogon gayanus	On the wadi edge.

VEGETATION ENUMERATION PLOT No. 3.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Ziziphus spina-christi	17	1	4	2	5	3	2	-	1					35
Acacia albida	1	-	-	-	-	-	1	1	-	1	-	1	8	13
Acacia adansonii	2	-	-	-	-	-	-	1						3
Acacia tortilis	5													5
Boscia senegalensis	3													3
Bauhinia rufescens	2													2
Calatropis procera	2													2
														63

VEGETATION ENUMERATION PLOT No. 3.

ASSOCIATION: Riparian Thorn Forest.

POSITION: On the east bank flood plain of the Wadi Tini, one mile north of plot No. 2.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2500'.

RAINFALL: 330 mm.

ASPECT & CONFIGURATION: Fairly sheltered. Level flood plain, liable to inundation when the wadi flows.

SOIL: A rich, dark-brown, fine sandy silt. A profile obtained from a nearby well showed:

Depth from Surface -

Surface to 2.0 M.	Brown silt as above.
2.0 to 2.5 M.	Coarse sand, buff colour with particles of black volcanic rocks.
2.5 to 10.0 M.	Brown silt with a higher proportion of sand than the surface silt.
10.0 M +	Black volcanic boulders in a matrix of sandy silt.

CANOPY & STOCKING: Upper canopy of Acacia albida discontinuous. About 0.6 of total closure. Shrub layer and grass poor.

HEIGHT & FORM: Maximum 45'

USE: Grazed. A small plot of snuff tobacco had been cleared nearly.

GRASSES & HERBS: Echinochloa colona.

Dactylatenium aegyptium.

VEGETATION ENUMERATION PLOT No. 4 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Capparis decidua	2													2
Acacia albida	1													1
Acacia adansonii	-	-	1											1
Cadaba rotundifolia	2													2
Boscia senegalensis	-	1												1
														7

VEGETATION ENUMERATION PLOT No. 4.

ASSOCIATION: Cultivation regrowth in Thorn Savanna on Sand country.

POSITION: 16 miles west of Fasher on the Tawilla road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2450'

RAINFALL: 320 mms.

ASPECT & CONFIGURATION: Fully exposed. A high lying stabilised sand dune.

SOIL: Golden-red sand. Loose on the surface, becoming more compacted at 6" to 12" depth, and more reddish in colour. Probably caused by ferruginous deposit in that horizon.

A typical 'qoz' soil.

CANOPY & STOCKING: Very open. Grass cover more or less complete. Bushes and trees very stunted and scattered.

HEIGHT & FORM: Grass and herbs to 2', average 18". Arboreal vegetation, Maximum 10' (Acacia adansonii); Boscia average 6' to 7'.

USE: Much grazed. Cultivated for bullrush millet within the last 5 years.

GRASSES & HERBS:

Cenchrus biflorus
Cenchrus prieurii
} abundant.

(H) Blepharis linariifolia - abundant.

(H) Geigeria alata - abundant.

Cymbopogon proximum - occasional, locally frequent.

Setaria verticillata - occasional, locally abundant.

VEGETATION ENUMERATION PLOT No. 5.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	68	MB	22	LB	1								91
Acacia tortilis	14	8	2											24
Acacia adansonii	5	3												8
Ziziphus spina-christi	6													6
Acacia mellifera	SB	1	MB	2	LB	2								5
Capparis decidua	1	2												3
Balanites aegyptiaca	2													2
Dichrostachys glomerata	3	2												5
Grewia tenax	3													3
Grewia flavescens	1													1
														148

VEGETATION ENUMERATION PLOT No. 5.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 8 miles west of Tawilla on Kebkabiya road. ½ mile north of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2500'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Exposed plateau.

SOIL: A reddish brown sedentary grit soil.
Developed from basement complex granites, probably of no great depth.
Quartz pebbles and granitic stones on surface.
A hard compacted soil.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 16' (Acacia mellifera)
Average 6' to 8'.

USE: Poor grazing.

GRASSES & HERBS: Thin grass cover of:
Aristida funiculata
Eragrostis gangetica and
Chloris pilosa.
Maximum 18"; Average 12" high.

VEGETATION ENUMERATION PLOT No. 6.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia arabica	480													480
Acacia albida	4													4
Rhynchosia ferruginea	8													8
Ricinis communis	4													4
Geigéria alata	20													20
														516
														= 5160
														per acre.

VEGETATION ENUMERATION PLOT No. 6.

ASSOCIATION: Riparian Thornland.

POSITION: South side Wadi Golo flood plain, inside proposed Shagera forest reserve. Opposite Abu Bakr village.

SIZE: 22 x 22 yds. = 1/10 acre.

ALTITUDE: 2430'

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Fairly sheltered. In a wide shallow natural depression in the wadi floor, (here about 3 miles wide).

SOIL: A lens of fine-grained cracking clay, in a plain of sandy silt (the wadi floor). Dark brown in colour, probably not more than 5 or 6 feet deep, deeply cracking on drying out.

CANOPY & STOCKING: Dense natural regeneration dating from the 1946, 1947 and 1950 floods.

HEIGHT & FORM: Varies from 1'6" to 8'. Average 5'6".

USE: About 100 out of 500 acres total have been cleared for tobacco cultivation.

GRASSES & HERBS: Grasses nil. Stocking too dense to permit of grass growth.

Numbers 3, 4 and 5 in the list opposite are herbs.

VEGETATION ENUMERATION PLOT No. 7.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	25	11	7	3	1									47
Acacia mellifera	SB	1	MB	-	LB	1								2
Cassia ashrek	1													1
														50

VEGETATION ENUMERATION PLOT No. 7 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 15 miles SSW of Fasher on the Melemm road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2450'

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: Exposed. Fairly high lying sand dune.

SOIL: A stabilised sand dune. Yellow brown in colour, surface fine and loose.
Superficial contamination with black ash from grass burning. (April 1952).

CANOPY & STOCKING: Very open. Average stocking about 20 medium-sized thorn trees per acre. Remaining 60% are mainly seedlings.

HEIGHT & FORM: Maximum 18'. } (Acacia senegal).
Average 12'-15' }
Seedlings average 2'6" (2 to 3 yrs. old) to 7' (5 yrs. old).

USE: Tapped for gum arabic. All the A. senegal above 3" diam. have been tapped.

GRASSES & HERBS:
Cenchrus biflorus } (abundant)
Cenchrus prieurii }
Aristida plumosa (frequent)
Aristida funiculata (occasional)
Aristida adscensionis (occasional)
(H) Blepharis linariifolia (abundant)

VEGETATION ENUMERATION PLOT No. 8.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	10	3	2	1										16
Anogeissus schimperi	2	2	2	2	3	2								13
Acacia mellifera	6	4												10
Acacia tortilis	3	1	-	1	1									6
Balanites aegyptiaca	2	-	1	-	-	-	-	1						4
Albizzia sericocephala	-	-	1	2	1									4
Acacia orfota	SB	1	MB	2	LB	-								3
Adansonia digitata	-	-	-	-	1	-	-	-	-	-	-	-	1	2
Hyphaene thebaica	-	2												2
Acacia adansonii	1													1
Albizzia anthelmintica	2	2	5	3	1	1								14
Combretum aculeatum	11	3												14
Grewia tenax	13													13
Cordia crenata	10	2												12
Grewia villosa	6	4	1											11
Capparis tomentosa	5													5
Cadaba farinosa	1	1												2
Cissus quadrangulus	1													1
Dichrostachys glomerata	1													1
														134

VEGETATION ENUMERATION PLOT No. 8 .

ASSOCIATION: Riparian Thornland.

POSITION: 10 miles E. of Nyala.

SIZE: 110 x 22 yds. = ½ acre.

ALTITUDE: 2210'

RAINFALL: 490 mms.

ASPECT & CONFIGURATION: Slight hollow; exposed.
Site of water onflow.

SOIL: A grey, non-cracking, fairly heavy silty-clay.

(an 'sn' soil type).

CANOPY & STOCKING: Closed. Stocking locally dense.

HEIGHT & FORM: Larger trees to 30' (Adansonia 40')
General level at 18' - 20'.

USE: Nil.

GRASSES & HERBS: Echinochloa colona.
Eragrostis gangetica

Thick and to 2'6" high in the lower levels of the site.

VEGETATION ENUMERATION PLOT No. 9.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	6	10	7	3	3									29
Acacia senegal	5	3	2											10
Acacia tortilis	5	1												6
Balanites aegyptiaca	3	-	-	-	1									4
Acacia adansonii	3	1												4
Combretum aculeatum	25	2												27
Cassia senua	3													3
Calatropis procera	1													1
														84

VEGETATION ENUMERATION PLOT No. 9 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: Umm Kardus, 20 miles E. of Nyala. N. of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2215'

RAINFALL: 480 mms.

ASPECT & CONFIGURATION: Exposed. High-lying sand dune to south of Jebel Umm Kardus.

SOIL: Stabilised sand dune. Reddish-yellow in colour, surface loose and friable, becoming more compacted and more reddish in colour at 18" depth.

(an 's' sand type).

CANOPY & STOCKING: Both open.

HEIGHT & FORM: Largest trees to 20'. Average 15'

USE: Nil, except grazing.

GRASSES & HERBS: Setaria verticillata
Eragrostis tremula
Chloris spp. (C. pilosa & C. prieurii)
Cenchrus biflorus
(H) Fagonia cretica
(H) Cleome viscosa

VEGETATION ENUMERATION PLOT No. 10 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Hyphaene thebaica	16													16
Ziziphus spina-christi	10	2	1	1	1									15
Balanites aegyptiaca	4	4		2	1									11
Acacia adansonii	2			1	2									5
Acacia seyal	3	2												5
Acacia tortilis	1	3												4
Acacia senegal	3	1												4
Acacia mellifera	SB	-	MB	-	LB	1								1
Guiera senegalensis.	1													1
Cassia senna	41													41
Combretum aculeatum	6	4												10
Grewia tenax	2													2
Cadaba farinosa	2													2
Albizzia anthelmintica	1													1
Dichrostachys glomerata	1													1
														119

VEGETATION ENUMERATION PLOT No. 10.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 30 miles E. of Nyala: South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2220'

RAINFALL: 470 mms.

ASPECT & CONFIGURATION: Gentle slope to north (leading to a water-holding depression about ¼ N. of plot).

SOIL: Dune sand. Deep, and in general unconsolidated.

(an 'ss' sand type).

CANOPY & STOCKING: Open.

HEIGHT & FORM: Largest trees to 25'.
Average 15' - 20'.

USE: Nil, except grazing.

GRASSES & HERBS: Eragrostis tremula (abundant)
Chloris spp. (abundant)
Cenchrus biflorus (rare)
Setaria verticillata (rare)
(H) Cassia acutifolia (abundant)

VEGETATION ENUMERATION PLOT No. 11.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	36	13	3											52
Combretum cordofanum	2	4	3	1										10
Albizzia sericocephala	1	1	2	3										7
Balanites aegyptiaca	1	2		2		1								6
Combretum aculeatum	4													4
														79

VEGETATION ENUMERATION PLOT No. 11.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 40 miles E. of Nyala: North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2230'

RAINFALL: 460 mms.

ASPECT & CONFIGURATION: Gently sloping. Long slope to south, slight sidelong slope to west.

SOIL: Red sand, loose on surface and to a depth of 3' to 4'.

Moist at 2'9" (14.12.51)

Top of sand dune, now consolidated.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Largest trees to 22' (Balanites)
Grass stocking good, dense, to 2'6" high.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida spp. (abundant)
Cenchrus biflorus (frequent)
Eragrostis sp. (? E. aspera) (occ.)
Aristida plumosa (occasional)

(H) Blepharis linariifolia

VEGETATION ENUMERATION PLOT No. 12.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	11	13	9	4	3	2								42
Acacia mellifera	SB	8	MB	16	LB	17								41
Acacia orfota	SB	21	MB	13	LB	3								37
Albizzia sericocephala	7	2	1	2										12
Acacia senegal	4	2	4	1										11
Ziziphus spina-christi	4	2												6
Dalbergia melanoxylon	2													2
Acacia seyal	1													1
Acacia tortilis	1													1
Dichrostachys glomerata	10	1												11
Cadaba farinosa	2													2
Grewia villosa	1													1
														167

VEGETATION ENUMERATION PLOT No. 12.

ASSOCIATION: Riparian Thornland.

POSITION: 50 miles East of Nyala (1 mile west of Mahugeria). South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2230'

RAINFALL: 460 mms.

ASPECT & CONFIGURATION: Fairly sheltered in all directions.

SOIL: Grey, non-cracking silty-clay.

(an 'sn' soil type).

CANOPY & STOCKING: Locally dense and nearly closed. (thicket closure).

HEIGHT & FORM: Highest trees to 25' (Balanites)
Thicket closure at 17'.

USE: Nil.

GRASSES & HERBS: Cenchrus biflorus
Chloris spp. (mainly C. pilosa)
Eragrostis tremula
E. aspera
Dactylatenium aegyptium

VEGETATION ENUMERATION PLOT No. 13.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	8	MB	9	LB	8								25
Acacia orfota	SB	13	MB	3	LB	-								16
Acacia seyal	2	2	1											5
Acacia adansonii	1	1												2
Balanites aegyptiaca	-	1	1											2
Grewia tenax	11	9												20
Cordia crenata	11	7												18
Dichrostachys glomerata	5	1												6
Cadaba farinosa	3	1												4
Cadaba glandulosa	2													2
														100

VEGETATION ENUMERATION PLOT No. 13.

ASSOCIATION: Riparian Thornland.

POSITION: 60 miles East of Nyala, 9 miles East of Mahugeria. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2230'.

RAINFALL: 460 mms.

ASPECT & CONFIGURATION: Exposed and level. Probably site of water onflow.

SOIL: Light brown sandy-silt, friable, some surface sand (water borne) in parts.
Superficial mud pan in places indicative of water standing on ground until evaporated.

CANOPY & STOCKING: Generally open. Local thicket closure over small areas.

HEIGHT & FORM: Average 15'.

USE: Grazing.

GRASSES & HERBS: Schoenfeldia gracilis
Eragrostis gangetica
Schmidtia pappophoroides
Aristida adscensionis

All occasional to locally frequent.

VEGETATION ENUMERATION PLOT No. 14.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	1	3	3	4	2	2								15
Commiphora africana	5	3	1											9
Acacia senegal	9													9
Acacia mellifera	SB	4	MB	2	LB	1								7
Acacia tortilis	3	1												4
Ziziphus spina-christi	2	1												3
Acacia orfota	SB	2	MB	1	LB	-								3
Balanites aegyptiaca	1		1											2
Dalbergia melanoxylon		1												1
Combretum aculeatum	94													94
Grewia tenax	10	5												15
Dichrostachys glomerata	9	1												10
Cordia crenata	6													6
Cissus quadrangulus	2													2
Grewia flavescens	1													1
Maerua angolensis	1													1
														182

VEGETATION ENUMERATION PLOT No. 14.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles North of Nyala on Fasher road. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2230'

RAINFALL: 490 mms.

ASPECT & CONFIGURATION: Exposed.

SOIL: Sedentary reddish-brown grit soil. Compacted. Water-washed quartz and granite pebbles on surface.

(Granite outcrop nearby)

Greatest depth of soil 3' - 4'. Overlying basement complex granite measures.

(A 'Bn' site)

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Highest trees 17'.
Average 10'.

USE: Nil.

GRASSES & HERBS: Aristida funiculata
Schmidtia pappophoroides

Sparse cover, 6" high at most.

VEGETATION ENUMERATION PLOT No. 15.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	11	9	8	1										29
Albizzia sericocephala	6	2	7	1	1	-	1	1						19
Acacia tortilis	7	2	2	-	1									12
Acacia orfota	SB	7	MB	4	LB	1								12
Acacia senegal	2	6	2											10
Ziziphus spina-christi	6	2												8
Acacia mellifera	SB	4	MB	3	LB	-								7
Balanites aegyptiaca	1	-	1											2
Dichrostachys glomerata	45	7												52
Combretum aculeatum	43	2												45
Grewia tenax	11													11
Grewia flavescens	10													10
Grewia villosa	8													8
Cadaba farinosa	6													6
Cordia crenata	3	2	1											6
Albizzia anthelmintica	1													1
														238

VEGETATION ENUMERATION PLOT No. 15.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 20 miles north of Nyala on Fasher road. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2240'.

RAINFALL: 480 mms.

ASPECT & CONFIGURATION: Fairly level; open in all directions.

SOIL: Rich reddish-brown loam of obvious sedentary origin. Much termite activity visible on surface. A few large quartz pebbles on surface.

(A slighly atypical 'Bn' site)

CANOPY & STOCKING: Canopy generally open. A fairly well stocked area of thorn savanna.

HEIGHT & FORM: Highest trees to 20'.
Average 13' - 15'.

USE: Nil. Might be cultivated if nearby water supplies existed.

GRASSES & HERBS: Aristida funiculata
Cenchrus ciliaris
Schmidtia pappophoroides

(H) Blepharis sp.

VEGETATION ENUMERATION PLOT No. 16 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL.
Acacia orfota	SB	56	MB	6	LB	3								65
Acacia senegal	14	13	2	1										30
Acacia tortilis	10	15	4											29
Acacia mellifera	SB	11	MB	12	LB	6								29
Acacia adansonii	8	4	1											13
Capparis tomentosa	11													11
Balanites aegyptiaca	3	2	-	1										6
Bauhinia reticulata	2	1												3
Hyphaene thebaica	2	(clump)												2
Acacia seyal	1	-	1											2
Albizzia sericocephala	1													1
Cadaba farinosa	16													16
Dichrostachys glomerata	6	1												7
Combretum aculeatum	3													3
Grewia tenax	3													3
Grewia villosa	2													2
Cadaba glandulosa	1													1
														223

VEGETATION ENUMERATION PLOT No. 16.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 30 miles north of Nyala. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2250'

RAINFALL: 465 mms.

ASPECT & CONFIGURATION: Fairly exposed. Sensibly level.

SOIL: A sandy-gritty loam of sedentary origin. Comparatively deep (over 3') for this type of soil. Some pebbles of quartz on surface and in top 18" of soil.

(A fairly deep 'Bu' soil).

CANOPY & STOCKING: Open on the whole. Local tendency to thicket closure.

HEIGHT & FORM: Highest trees 20'.
Average 13'.

USE: Nil. Would probably be cultivated if water supplies available within reasonable distance.

GRASSES & HERBS: Echinochloa pyramidalis only.

(Low, recumbent grass, 6" high at most).

VEGETATION ENUMERATION PLOT No. 17.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	16	MB	21	LB	16								53
Commiphora africana	12	5	3	4	3	1								28
Acacia mellifera	SB	5	MB	3	LB	5								13
Dalbergia melanoxylon	4	7												11
Acacia senegal	-	2	1											3
Capparis tomentosa	2													2
Acacia tortilis	-	1												1
Grewia tenax	19													19
Combretum aculeatum	17													17
Inidet. "Umm Shabudbud"	6													6
Grewia villosa	6													6
Cordia crenata	-	2	1											3
Cadaba farinosa	3													3
Albizzia anthelmintica	1	-	1											2
Grewia flavescens	2													2
Cissus quadrangulus	1													1
														170

VEGETATION ENUMERATION PLOT No. 17 .

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 40 miles north of Nyala (5 miles south of Minawashie). West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2265'

RAINFALL: 445 mms.

ASPECT & CONFIGURATION: Fairly level and exposed.

SOIL: Sandy grit soil of sedentary origin with many stones in upper profile (to 2' depth). Locally stones on surface, usually quartz.

(A 'Bu' grit-soil type).

CANOPY & STOCKING: Local thicket closure extending over areas 20' - 25' in diameter.
Elsewhere open.

HEIGHT & FORM: Average 18' for highest trees.
Otherwise 10'.

USE: Nil.

GRASSES & HERBS: Aristida funiculata (abundant)
Cenchrus ciliaris (frequent - occasional)
Cenchrus biflorus (rare)

VEGETATION ENUMERATION PLOT No. 18.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia tortilis	28	22	19	5	1	1								76
Gymnosporia senegalensis	19	2												21
Ziziphus mucronata	-	4	4	4	5	2	1							20
Albizzia sericocephala	5	2	-	1	-	1	-	-	-	-	-	-	1	10
Bauhinia rufescens	1	3	2	2	1									9
Balanites aegyptiaca	3	-	3	1	-	1								8
Cordia rothii	5	1												6
Acacia mellifera	SB	1	MB	2	LB	2								5
Acacia senegal	2	-	2											4
Acacia adansonii	2	-	1											3
Bauhinia reticulata	1	-	-	-	-	1								2
Acacia sieberiana													1	1
Ziziphus spina-christi	-	1												1
Combretum aculeatum	8	1												9
Grewia villosa	3	2												5
Dichrostachys glomerata	3	2												5
Grewia tenax	3													3
Cissus quadrangulus	2													2
														190

VEGETATION ENUMERATION PLOT No. 18 .

ASSOCIATION: Riparian Thorn Forest.

POSITION: South bank of Wadi Minawashie.
(East of road crossing).

SIZE: 110 x 22 yds. = ½ acre.

ALTITUDE: 2250'

RAINFALL: 430 mms.

ASPECT & CONFIGURATION: Sheltered on all sides except the edge open to the wadi - the N long side of this plot. Wadi 150 yds. wide here.

SOIL: Dark brown sandy alluvium. Free and light in texture. Deep and well drained.

CANOPY & STOCKING: Closed.

HEIGHT & FORM: Highest trees to 45'

USE: Nil.

GRASSES & HERBS: Cynodon dactylon
Echinochloa colona

VEGETATION ENUMERATION PLOT No. 19.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	15	16	10	9	7	2	3							62
Acacia mellifera	SB	13	MB	6	LB	2								21
Acacia tortilis	12													12
Albizzia sericocephala	2	2												4
Ziziphus spina-christi	1	1												2
Dalbergia melanoxylon	1													1
Combretum aculeatum	60													60
Dichrostachys glomerata	18	4												22
Grewia flavescens	12													12
Grewia tenax	4													4
Grewia villosa	3													3
Cordia crenata	2													2
														205

VEGETATION ENUMERATION PLOT No. 19.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 50 miles north of Nyala: 5 miles N. of Minawashie. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2285'.

RAINFALL: 420 mms.

ASPECT & CONFIGURATION: Exposed. Slight slope to south.

SOIL: Sandy, light-brown, open texture soil.
Probably mainly of sedentary origin, with slight superficial additions from areas uphill of the plot.
Of moderate depth (over 2'6"), but poor profile development.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Average 9' - 10'.
Highest 12' - 15'.

USE: Nil, except grazing.

GRASSES & HERBS: *Aristida* spp. (abundant)

VEGETATION ENUMERATION PLOT No. 20 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	95	MB	5	LB	1								101
Acacia senegal	8													8
Acacia orfota	SB	7	MB	-	LB	-								7
Combretum micranthum	3													3
Boscia senegalensis	6													6
Combretum aculeatum	3													3
Cadaba farinosa	2													2
														130

VEGETATION ENUMERATION PLOT No. 20 .

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 60 miles North of Nyala. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Open and exposed.

SOIL: Consolidated sand. Deep and open texture. Reddish brown in colour, becoming yellow brown at 12" - 18" depth. An old sand dune, now stabilised.

(An 's' sand type of soil).

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 10' - 12'.
Average 6' - 8'.

USE: Cultivated for "bullrush" millet (Pennisetum sp.) This area abandoned 10 years ago.

GRASSES & HERBS:

Cenchrus biflorus	(abundant)
Chloris pilosa	(frequent)
Eragrostis tremula	(frequent)

VEGETATION ENUMERATION PLOT No. 21 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	5	MB	14	LB	11								30
Capparis decidua	3	5	3	1	2	1								15
Acacia orfota	SB	2	MB	5	LB	6								13
Cordia rothii	-	-	1	2	1									4
Capparis tomentosa	2													2
Balanites aegyptiaca	1													1
Acacia tortilis	-	-	-	-	1									1
Boscia senegalensis	25	3												28
Cordia crenata	11													11
Combretum aculeatum	4													4
Grewia tenax	4													4
Dichrostachys glomerata	1													1
														114

VEGETATION ENUMERATION PLOT No. 21.

ASSOCIATION: Riparian Thornland.

POSITION: 70 miles North of Nyala; 3 miles North of Mosku, and 3 miles South of Shingal Tobaia. West of road.

SIZE: 110 x 22 yds. = ½ acre.

ALTITUDE: 2315'

RAINFALL: 390 mms.

ASPECT & CONFIGURATION: Flat plain. Exposed.

SOIL: Alluvial silt. Fan shaped terminal delta of the Wadi Darura.
Fine, open texture; deep and well drained; light brown colour. Very friable.

CANOPY & STOCKING: Generally open, with local areas of thicket closure. These areas may be 25' to 30' in diameter, and are generally centred round a Capparis decidua.

HEIGHT & FORM: Average 10'. Thickets go up to 20' in exceptional cases.

USE: This type of land is much used for tobacco cultivation (native snuff tobacco).

GRASSES & HERBS: Echinochloa colona (indicator species of sites on which water stands).
Cynodon dactylon (near Wadi)
Tribulus terrestris

VEGETATION ENUMERATION PLOT No. 22 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	118	MB	17	LB	-								135
Acacia orfota	SB	66	MB	1	LB	-								67
Balanites aegyptiaca	4	3	3	-	2									12
Capparis decidua	-	3	2	-	1									6
Acacia tortilis	-	-	-	-	-	1								1
Boscia senegalensis	14	7	1											22
Cordia crenata	9	1												10
Cadaba farinosa	5													5
Cissus quadrangulus	2													2
Combretum aculeatum	1													1
														261

VEGETATION ENUMERATION PLOT No. 22.

ASSOCIATION: Riparian Thornland.

POSITION: 80 miles North of Nyala; 7 miles North of Shingal Tobaia. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2330'.

RAINFALL: 375 mms.

ASPECT & CONFIGURATION: Open and exposed.

SOIL: Water borne silt deposit (20' to 30' deep) lying on top of a white sand. A zone of deposition for the fine particles from surrounding sand-dunes. Slight tendency to cake and crack on the surface.

CANOPY & STOCKING: Open in general. Acacia mellifera and A. orfota in places form closed thicket some 5' - 6' high.

HEIGHT & FORM: Balanites to 20'.
Remainder from 3' to 8' high only.

USE: Grazed. Certain amount of thorn cutting for fencing. Could be cultivated.

GRASSES & HERBS: Schmidtia pappophoroides
Eragrostis tremula
Aristida spp. (mainly A. funiculata)
Tribulus terrestris

VEGETATION ENUMERATION PLOT No. 23.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Balanites aegyptiaca	26	8	3											37
Acacia tortilis	18	2												20
Acacia orfota	SB	6	MB	2	LB	-								8
Acacia mellifera	SB	6	MB	-	LB	-								6
Acacia senegal	2	3												5
Ziziphus spina-christi	5													5
Albizzia sericocephala	1													1
Cadaba farinosa	19	2												21
Boscia senegalensis	9													9
Ricinis sp.	2													2
														114

VEGETATION ENUMERATION PLOT No. 23 .

ASSOCIATION: Riparian Thornland.

POSITION: 90 miles North of Nyala; 45 miles South of Fasher. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2345'

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Fairly level and exposed.

SOIL: Very sandy silt. Plot slightly to west of and at foot of sand dune.
Light brown colour. Friable.

CANOPY & STOCKING: Open to very open.

HEIGHT & FORM: Acacia tortilis to 12'.
Average height of remainder 6' only.

USE: Grazing. Cutting of thorn bushes for fencing material.

GRASSES & HERBS: Cenchrus biflorus
Aristida funiculata
(H) Geigeria alata (abundant)

VEGETATION ENUMERATION PLOT No. 24.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	13	11	3	3	6	1	2	1						40
Acacia senegal	3	5	4											12
Acacia tortilis	2	2	1											5
Acacia orfota	SB	1	MB	-	LB	-								1
Boscia senegalensis	2	-	1											3
Combretum aculeatum	1													1
														62

VEGETATION ENUMERATION PLOT No. 24.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 100 miles North of Nyala: 35 miles South of Fasher. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2360'

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Level and exposed.

SOIL: Stabilised sand dune. Yellow-brown on surface, becoming reddish-yellow at 2'6" to 3'. Light and free draining.

(An 's' soil type)

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Highest Balanites 26'.
General average 15' to 20'.

USE: Land of this type used for cultivation of "bullrush" millet and sesame. This plot has in all probability not been cultivated - at least for many years.

GRASSES & HERBS:
Cenchrus biflorus } (abundant)
Cenchrus prieurii }
Chloris pilosa (abundant)
Schoenfeldia gracilis (abundant)
Dactylatenium aegyptium (frequent)
Aristida sp. (frequent)
Eragrostis tremula (rare)

VEGETATION ENUMERATION PLOT No. 25.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia orfota	SB	34	MB	1	LB	-								35
Acacia tortilis	11	4	3											18
Acacia senegal	3	3												6
Acacia mellifera	SB	3	MB	2	LB	-								5
Ziziphus spina-christi	3													3
Boscia senegalensis	*41	4												45
Cadaba farinosa	1													1
														113

* 37 dead.

VEGETATION ENUMERATION PLOT No. 25.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 110 miles North of Nyala: 25 miles South of Fasher: West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2375'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Open.

SOIL: Stabilised sand dune. Surface yellow-brown, becoming reddish-brown at 2' depth. Free draining. Some indications of local superficial pan formation - probably ferruginous in origin.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Average 8' to 9'.
Most of the small bush size Acacia orfota are 18" to 2' high by 2' to 3' crown diameter.

USE: Grazed.

GRASSES & HERBS: Cenchrus barbatus (abundant)
Erogrostis tremula (abundant)
Aristida funiculata (abundant)
Schoenfeldia gracilis (occasional)

VEGETATION ENUMERATION PLOT No. 26.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	8	MB	12	LB	21								41
Ziziphus spina-christi	*17	5	≠ 3	1										26
Balanites aegyptiaca	6	7	-	-	-	-	-	≠ 1	≠1					15
Capparis decidua	7	4	2											13
Acacia adansonii	2	-	-	-	-	1	1							4
Capparis tomentosa	1													1
Cadaba glandulosa	15													15
Boscia senegalensis	5	5												10
Cadaba farinosa	4													4
Grewia tenax	3	1												4
Cordia crevata	1													1
														134

NOTES:

* 10 of these are stool shoots from cut over stumps of larger size.

≠ 2 of these are cut above 4'3".

≠ Both of these cut above 4'3" and had pollarded.

VEGETATION ENUMERATION PLOT No. 26.

ASSOCIATION: Riparian Thornland.

POSITION: 121 miles North of Nyala: 14 miles South of Fasher. On the Wadi Golo north bank. West of road crossing.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2390'

RAINFALL: 315 mms.

ASPECT & CONFIGURATION:

SOIL: A sandy silt alluvium. Dark brown in colour; friable; free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: From 20' to 25' maximum (Acacia adansonii)

USE: Much of the vegetation has been cut over for poles and firewood.

GRASSES & HERBS: Echinochloa colona (frequent)
Aristida spp. (occasional)
Echinochloa pyramidalis (occasional)

VEGETATION ENUMERATION PLOT No. 27.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Capparis decidua	14	6												20
Acacia orfota	SB	7	MB	2	LB	-								9
Acacia mellifera	SB	1	MB	-	LB	1								2
Acacia tortilis	-	1												1
Grewia tenax	1	1												2
Cadaba farinosa	1													1
														35

VEGETATION ENUMERATION PLOT No. 27.

ASSOCIATION: Riparian Thornland.

POSITION: 130 miles North of Nyala: 5 miles South of Fasher. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2400'.

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Level. Fairly open plain.

SOIL: Alluvial sandy-silt. Fine; light-brown in colour; friable but with a local tendency to cake on the surface.
Becomes darker brown at 10' depth, and is laid on a white sand at 30'-35' depth.

CANOPY & STOCKING: Open, with small patches of vegetation based on a Capparis bush.

HEIGHT & FORM: Highest "island" of vegetation 9'.
Average height 5' - 6'.

USE: Similar soils used for tobacco cultivation.

GRASSES & HERBS:
Aristida sp. (abundant)
Chloris sp. (abundant)
Schoenfeldia gracilis (frequent)
Eragrostis gangetica (frequent)
Cenchrus biflorus (occasional)
(H) Geigeria alata (occasional)

VEGETATION ENUMERATION PLOT No. 28.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Capparis decidua	10	1												11
Acacia tortilis	9													9
Ziziphus spina-christi	5													5
Acacia orfota	SB	2	MB	-	LB	-								2
Balanites aegyptiaca	1													1
Cadaba farinosa	10													10
Boscia senegalensis	5													5
Dichrostachys glomerata	1													1
														44

VEGETATION ENUMERATION PLOT No. 28 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 13 miles West of Fasher on Kebkabiya road. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2440'

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: Gentle slope to east. (i.e. on the east side of a sand dune).

SOIL: Stabilised sand dune. Surface fairly loose, light brown in colour. Certain amount of surface cementation - reddish brown in colour, probably ferruginous in origin. These patches extend to a depth of about 3', after which the colour becomes light yellow-brown and the texture loose.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Maximum 6'.

USE: Cultivation. This plot may have been cultivated within the last 10 years.

GRASSES & HERBS: Aristida sp. (abundant)
Cenchrus sp. (occasional)
Aristida stipoides (rare)
Schoenfeldia gracilis (rare)

Grasses to 12" high and provide more of less complete soil cover.

VEGETATION ENUMERATION PLOT No. 29.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	3	MB	-	LB	-								3
Acacia orfota	SB	1	MB	-	LB	-								1
Acacia tortilis	1													1
Cadaba glandulosa	1													1
														6

VEGETATION ENUMERATION PLOT No. 29 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 23 miles West of Fasher. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2490'

RAINFALL: 320 mms.

ASPECT & CONFIGURATION: Level. High and exposed.

SOIL: Coarse gritty sand. Yellow brown in colour with numerous igneous (basalt) and quartz pebbles and volcanic scoriae on surface. Volcanic hills to north, and this is probably an old lava flow, thinly covered with wind blown sand.

CANOPY & STOCKING: Nil. Grassland with very scattered trees and bushes.

HEIGHT & FORM: Arboreal vegetation 2'.
Grasses 12" in general.

USE: Nil.

GRASSES & HERBS: Aristida sp. (abundant)
Cenchrus biflorus (abundant)
Schoenfeldia gracilis (occasional)
Cymbopogon proximus (local, to 4' high)

VEGETATION ENUMERATION PLOT No. 30.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Capparis decidua	18													18
Acacia tortilis	2													2
Ziziphus spina-christi	1													1
Acacia orfota	SB	1	MB	-	LB	-								1
Boscia senegalensis	1													1
														23

VEGETATION ENUMERATION PLOT No. 30.

ASSOCIATION: Riparian Thornland.

POSITION: 33 miles West of Fasher. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2600'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Exposed. Level.

SOIL: Gritty, sandy silt with a high proportion of coarse sand. Light to mid-brown in colour. Small quantity of water washed pebbles on surface, mainly quartz.

Incipient surface pan in places caused by water standing till evaporated, texture becomes fine and colour dark brown. Apart from these places, drainage is very free.

CANOPY & STOCKING: Open grassland with scattered trees and bushes.

HEIGHT & FORM: Capparis to 7' high by 8' to 9' in diameter. Grass 12" to 18".

USE: Similar land used for tobacco cultivation.

GRASSES & HERBS:

Aristida sp. (abundant)
Schoenfeldia gracilis (abundant)
Aristida pallida (frequent)
Cenchrus biflorus (occasional)
Eragrostis gangetica (occasional)

VEGETATION ENUMERATION PLOT No. 31.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera		17		12		7								36
Capparis decidua	2	3	1											6
Capparis tomentosa	3	1												4
Acacia tortilis	2	1	-	-	-	1								4
Acacia orfota	SB	1	MB	-	LB	-								1
Commiphora africana	-	-	1											1
Calatropis procera	1													1
Boscia senegalensis	21	6	3	2										32
Grewia tenax	9													9
Cissus quadrangulus	9													9
Cadaba farinosa	2	1												3
														106

VEGETATION ENUMERATION PLOT No. 31.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 38 miles West of Fasher, 3 miles West of Tawilla. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2610'.

RAINFALL: 340 mms.

ASPECT & CONFIGURATION: Level and exposed.

SOIL: Sedentary soil of poor profile, developed on igneous rocks. Surface covered with water washed quartz and other pebbles. Soil of no great depth (not more than 2'). Traversed by a small water channel with a bed of coarse sand, and the country rock (a coarse schist) exposed in places.

CANOPY & STOCKING: Fairly open. Closed locally at the edge of the small stream.

HEIGHT & FORM: Maximum 15'.
Average 8' to 9'.

USE: Nil, except poor grazing.

GRASSES & HERBS: Aristida sp. (abundant)
Aristida pallida (occasional)

VEGETATION ENUMERATION PLOT No. 32 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	36	MB	9	LB	7								52
Acacia orfota	SB	7	MB	2	LB	-								9
Acacia tortilis	5	1												6
Capparis tomentosa	2													2
Balanites aegyptiaca	-	-	1											1
Capparis decidua	-	1												1
Acacia adansonii	-	1												1
Cadaba farinosa	2													2
Cordia crenata	1	1												2
Cissus quadrangulus	1													1
														77

VEGETATION ENUMERATION PLOT No. 32 .

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 48 miles West of Fasher: 13 miles West of Tawilla. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2600'

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Level and exposed.

SOIL: Similar to last plot. Poor sedentary soil developed on a base of igneous or metamorphic rocks. Not over 2' deep, no profile development.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 11'.
Average 7'.

USE: Nil. Some thorn species have been cut for purpose of erecting a game trap nearby the plot.

GRASSES & HERBS: Aristida sp. (frequent)
Chloris sp. (frequent)

VEGETATION ENUMERATION PLOT No. 33 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	22	MB	18	LB	10								50
Ziziphus spina-christi	6	1												7
Commiphora africana	2	-	1	2	1									6
Acacia tortilis	-	1	-	1										2
Acacia seyal	1													1
Acacia senegal	1													1
Capparis decidua	1													1
Capparis tomentosa	1													1
Grewia tenax	6													6
Grewia villosa	5													5
Grewia flavescens	2													2
Combretum aculeatum	2													2
Cordia crenata		1												1
														85

VEGETATION ENUMERATION PLOT No. 33.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 58 miles West of Fasher: in the Suweinat hills. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4550'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Fairly steep slope. Northern exposure.

SOIL: Volcanic rock matrix with a partly derived but probably mainly transported soil in the interstices. Dark brown, rich, free draining.

CANOPY & STOCKING: Fairly open.

HEIGHT & FORM: Maximum 11'.
Average 6' - 8'.

USE: Nil.

GRASSES & HERBS: Aristida sp. (abundant)
Schoenfeldia gracilis (frequent)
Eragrostis sp. (occasional to rare)

VEGETATION ENUMERATION PLOT No. 34.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	27	MB	22	LB	33								82
Commiphora africana	10	8	1	1										20
Acacia seyal	4	1												5
Acacia tortilis	1	-	1											2
Ziziphus spina-christi	1	1												2
Capparis decidua	1													1
Acacia orfota	SB	1	MB	-	LB	-								1
Albizzia sericocephala	1													1
Acacia adansonii	-	-	-	1										1
Balanites aegyptiaca	1													1
Dichrostachys glomerata	11													11
Capparis tomentosa	6													6
Grewia tenax	4	1												5
Grewia villosa	3													3
Cadaba farinosa	2													2
Grewia flavescens	1													1
														144

VEGETATION ENUMERATION PLOT No. 34.

ASSOCIATION: Acacia mellifera - Commiphora - A tortilis - A. orfota.

POSITION: 68 miles West of Fasher. In the Suweinat hills. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4600'.

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Upward slope to north for first 150 yards, then a level plain stretching about one mile.

SOIL: Very stony volcanic loam. Large stones of igneous material on surface. Soil rich brown in colour, free and friable, occurring in pockets in the boulder matrix.

CANOPY & STOCKING: Closed in patches. Dense.

HEIGHT & FORM: Maximum 14' to 16'.
Average 10'.

USE: Nil.

GRASSES & HERBS: Aristida sp. (abundant)
Eragrostis sp. (frequent)
Chloris pilosa (occasional)

VEGETATION ENUMERATION PLOT No. 35.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	22	MB	38	LB	8								68
Commiphora africana	7	4												11
Acacia seyal	4	3	1											8
Acacia orfota	SB	5	MB	1	LB	-								6
Capparis tomentosa	4													4
Ziziphus spina-christi	3	1												4
Balanites aegyptiaca	1	2												3
Acacia tortilis	2													2
Grewia tenax	3													3
Cadaba farinosa	2													2
Grewia villosa	1													1
														112

VEGETATION ENUMERATION PLOT No. 35.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 78 miles West of Fasher; 14 miles East of Kebkabiya. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4570'

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Fairly level, high lying plateau.

SOIL: A fine, dark-brown soil, fairly light and friable, in a matrix of igneous rocks and rock fragments. Pebbles and stones of rock on surface.

The soil probably extends downwards in the cracks for a considerable depth.

CANOPY & STOCKING: Average: 0.65 of total closure.

HEIGHT & FORM: Average canopy level 8' to 9'.
Individual emergants to 16'.

USE: Nil.

GRASSES & HERBS: Aristida sp. (abundant)
Eragrostis tremula, E. gangetica (frequent)
Cenchrus biflorus (rare)

VEGETATION ENUMERATION PLOT No. 36.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	33	MB	56	LB	22								111
Balanites aegyptiaca	2	-	2	1										5
Boscia senegalensis	16													16
Grewia tenax	9													9
Cadaba farinosa	7													7
Dichrostachys glomerata	5	1												6
														154

VEGETATION ENUMERATION PLOT No. 36.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 88 miles West of Fasher: 4 miles East of Kebkabiya. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4570'

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Fairly exposed. Slight slope to North.

SOIL: Sedentary soil of no great depth, developed on basement complex granite measures. Surface colour light to mid-brown. Soil coarse gritty and compacted. Many stones on surface.

CANOPY & STOCKING: More or less closed thorn thicket.

HEIGHT & FORM: Average canopy 8'.
Balanites to 15'.

USE: Nil.

GRASSES & HERBS: Poor thin grass cover. Mainly Aristida spp.

VEGETATION ENUMERATION PLOT No. 37.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	60	14	9	3	1	1								88
Acacia seyal	23	5	1											29
Ziziphus spina-christi	10	6	4	1										21
Capparis tomentosa	11													11
Albizzia sericocephala	7	-	-	-	1									8
Balanites aegyptiaca	2	4	-	1	-	-	-	-	-	-	1			8
Acacia adansonii	1	3	3											7
Acacia mellifera	SB	5	MB	1	LB	-								6
Capparis decidua	1													1
Cadaba farinosa	11													11
Dichrostachys glomerata	4	1												5
														195

VEGETATION ENUMERATION PLOT No. 37.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles West of Kebkabiya. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4500'.

RAINFALL: 375 mms.

ASPECT & CONFIGURATION: Level. Fairly open and exposed.

SOIL: Sedentary soil, approximately 10' deep, developed on igneous rock base. Rich brown loam, partially obscured locally by superficial sand drift (wind blown sand).

CANOPY & STOCKING: Tends towards closure locally. Otherwise open thorn savanna of fairly good quality.

HEIGHT & FORM: Maximum 25'. Average tree level 15', and understorey 8'. Much natural regeneration.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Cymbopogon proximus
Schoenfeldia gracilis
Schmidtia pappophoroides.

VEGETATION ENUMERATION PLOT No. 38.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	70	22	8	1										101
Acacia mellifera	SB	4	MB	12	LB	14								30
Capparis tomentosa	26													26
Acacia seyal	1	9	5	3										18
Acacia orfota	SB	3	MB	4	LB	-								7
Balanites aegyptiaca	-	3	3	1										7
Acacia adansonii	4	1	1											6
Albizzia sericocephala	2	-	1											3
Ziziphus spina-christi	1													1
Cadaba farinosa	36													36
Dichrostachys glomerata	9	2												11
Grewia flavescens	2													2
Albizzia anthelmintica	1	-	1											2
Cordia crenata	1													1
														251

VEGETATION ENUMERATION PLOT No. 38.

ASSOCIATION: Albizzia - Acacia

POSITION: 20 miles West of Kebkabiya. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4400'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Open and exposed. Level.

SOIL: Deep sedentary soil, developed probably from an igneous rock. A rich brown loam. Some small pebbles and stones of parent rock material on surface (a fine grained rock).

CANOPY & STOCKING: Open. Locally closed at 12' to 13' in small thickets of Acacia mellifera.

HEIGHT & FORM: Maximum 16' to 18' (Acacia senegal and A. seyal). Average level of main species 12' to 13', and of understorey species, 6' to 8'.

USE: Nil.

GRASSES & HERBS: Chloris sp. (frequent)
Dinebra retroflexa (occasional)
Aristida spp. (rare)
Tribulus terrestris (rare)

VEGETATION ENUMERATION PLOT No. 39.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia seyal	18	8	8	4	4	* 2	1							45
Albizzia sericocephala	4	7	*13	8	* 7									39
Acacia senegal	15	8	1	-	1									25
Acacia mellifera	SB	5	MB	4	LB	1								10
Acacia adansonii	-	-	1	2										3
Ziziphus spina-christi	-	1												1
Capparis tomentosa	9	2												11
Dichrostachys glomerata	6	1												7
Cordia crenata	2													2
Cadaba farinosa	2													2
Combretum aculeatum	1													1
														146

NOTE:

* Dead. Cut by graziers for browse.

VEGETATION ENUMERATION PLOT No. 39 .

ASSOCIATION: Albizzia - Acacia.

POSITION: 30 miles West of Kebkabiya. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4500'.

RAINFALL: 440 mms.

ASPECT & CONFIGURATION: Exposed. Gentle sidelong slope to East towards drainage channel. Plot runs North and South.

SOIL: Over the main part of the plot the soil is a sedentary grit. Much granite and quartz pebbles and stones on surface. Derived from basement complex measures. Soil 12" to 2' deep only, light brown, compacted, no profile development.

Towards the Khor to the East, the soil is a sandy-silt alluvium. Dark brown, rich, deeper (up to 6' and more). Some surface cracking.

CANOPY & STOCKING: Variable. Open over most of the area. Locally closed at 20' in small consociations of Albizzia.

HEIGHT & FORM: Maximum 22' (Albizzia) and 18" to 20" (Acacia seyal). Average of remainder, 8".

USE: Nil. Cutting for firewood and lopping for browse by nomad graziers.

GRASSES & HERBS: Chloris sp. (abundant)
Aristida sp. (locally frequent)
Echinochloa colona } local on silts
Cynodon dactylon } near the Khor.

VEGETATION ENUMERATION PLOT No. 40.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	34	14	5											53
Acacia seyal	12	14	4	2										32
Acacia mellifera	SB	13	MB	6	LB	8								27
Acacia orfota	SB	3	MB	2	LB	-								5
Albizzia sericocephala	3	2	1											6
Acacia adansonii	2	1	1											4
Ziziphus spina-christi	2	1												3
Cadaba farinosa	14													14
Dichrostachys glomerata	7	1												8
Capparis tomentosa	8													8
														160

VEGETATION ENUMERATION PLOT No. 40.

ASSOCIATION: Albizzia - Acacia.

POSITION: 40 miles West of Kebkabiya. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4200'.

RAINFALL: 480 mms.

ASPECT & CONFIGURATION: Open and exposed. Level.

SOIL: Poor, probably thin, sedentary grit soil, developed from basement complex measures. Stones and pebbles of granite on surface.

CANOPY & STOCKING: Typically open.

HEIGHT & FORM: Maximum 18'.
Average 10'.

USE: Nil.

GRASSES & HERBS: *Aristida* spp. Poor thin cover.

VEGETATION ENUMERATION PLOT No. 41.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	22	12	4	1	-	1								40
Acacia mellifera	SB	13	MB	13	LB	9								35
Acacia senegal	6	3	2											11
Acacia orfota	SB	-	MB	2	LB	1								3
Commiphora africana	1	-	1											2
Acacia tortilis	1													1
Cadaba farinosa	16	1												17
Cordia crenata	5	5												10
Grewia flavescens	9													9
Dichrostachys glomerata	9													9
Boscia senegalensis	4													4
Albizzia anthelmintica	-	-	1											1
Combretum aculeatum	1													1
Cissus quadrangulus	1													1
														144

VEGETATION ENUMERATION PLOT No. 41.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles North of Kebkabiya on the Kutum road. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4570'.

RAINFALL: 363 mms.

ASPECT & CONFIGURATION: Fairly high exposed plateau. Somewhat undulating surface, with small water channels cut into it.

SOIL: Sedentary grit soil of poor profile. Compacted, shallow, 12" to 18" deep at most, and frequently much less. Profusion of quartz and other stones on surface. Colour reddish-brown.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 13' (Acacia mellifera)
Average 8' to 9'.

USE: Nil.

GRASSES & HERBS: Aristida spp. (abundant)

VEGETATION ENUMERATION PLOT No. 42.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	19	MB	43	LB	7								69
Acacia senegal	4	6	3	1										14
Ziziphus mucronata	2	3	4	-	-	-	-	-	-	-	-	-	1	10
Balanites aegyptiaca	1	5	2	-	1									9
Commiphora africana	1	-	1	1	1	1								5
Albizzia sericocephala	1	1	-	1										3
Anogeissus schimperi	-	-	1	1	1									3
Acacia tortilis	1	-	1											2
Lannea humilis	-	-	-	-	1									1
Acacia adansonii	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Capparis tomentosa	1													1
Boscia senegalensis	68	3												71
Cadaba farinosa	11													11
Cissus quadrangulus	4													4
Cordia crenata	3													3
Grewia flavescens	2													2
Albizzia anthelmintica	1													1
Grewia tenax	1													1
														211

VEGETATION ENUMERATION PLOT No. 42.

ASSOCIATION: Riparian Thornland.

POSITION: 20 miles North of Kebkabiya on Kutum road. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4570'.

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Gentle slope to East down to 20 yd. broad Wadi (inside plot at East end).

SOIL: Variable according to site. Soil types measured along the length of the plot are as follows:-

0 - 150 yds. Sedentary grit soil with A. mellifera scrub.

150 - 171 yds. Sedentary: Wadi fringing vegetation; Dense A. mellifera, Ziziphus, Albizzia and Balanites.

171 - 190 yds. Wadi bed. Bare coarse sand.

190 - 220 yds. Low bank of sandy alluvium carrying mainly A. senegal and some Ziziphus.

CANOPY & STOCKING: Locally closed, particularly on the Wadi fringe. Elsewhere open.

HEIGHT & FORM: 27' to 30' on Wadi fringe. Average elsewhere 12' - 13'.

USE: Nil.

GRASSES & HERBS: Aristida spp. (sedentary soils)
Chloris gayana (wadi fringe)

VEGETATION ENUMERATION PLOT No. 43 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24	TOTAL
Acacia mellifera	SB	9	MB	6	LB	9								24
Acacia tortilis	12	4	-	2										18
Acacia adansonii	4	4	2	1	1									12
Balanites aegyptiaca	4	2	2	2										10
Acacia orfota	SB	-	MB	3	LB	1								4
Ziziphus spina-christi	-	2	1											3
Acacia seyal	1	2												3
Acacia senegal	-	1	1											2
Commiphora africana	-	-	1											1
Albizzia sericocephala	1													1
Cordia crenata	16													16
Dichrostachys glomerata	5	5												10
Boscia senegalensis	3													3
Grewia tenax	2													2
Cadab farinosa	1													1
														110

VEGETATION ENUMERATION PLOT No. 43.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 30 miles North of Kebkabiya on Kutum road. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4600'

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Sheltered to east; slight slope to north. High-lying.

SOIL: Sedentary, but better developed than usual. 2' deep, light brown gritty loam. Many stones and gravel in profile and on surface (mainly quartz). Developed from a basement complex granite.

CANOPY & STOCKING: Generally open. Tendency towards thicket closure, especially of A. mellifera.

HEIGHT & FORM: Maximum 19'. (A. adansonii)
Average 12'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.
Cymbopogon proximus (local)

VEGETATION ENUMERATION PLOT No. 44 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	11	7	5	5	3	3								34
Acacia mellifera	SB	2	MB	5	LB	10								17
Acacia orfota	SB	2	MB	1	LB	1								4
Acacia senegal	-	1												1
Capparis tomentosa	1													1
Cordia crenata	10	12												22
Boscia senegalensis	9													9
Cadaba farinosa	5													5
Cissus quadrangulus	5													5
Cadaba glandulosa	4													4
Dichrostachys glomerata	4													4
Grewia tenax	2													2
Grewia villosa	2													2
														110

VEGETATION ENUMERATION PLOT No. 44.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 40 miles North of Kebkabiya on the Kutum road, East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4600'

RAINFALL: 357 mms.

ASPECT & CONFIGURATION: Gentle slope to east, becoming steeper towards end of plot. Eastern exposure.

SOIL: Sedentary grit soil. Light to mid brown in colour, very friable (i.e. not compacted as normal). Stones and pebbles on surface, mainly quartz but also some brown basalt chips.

CANOPY & STOCKING: Local thicket closure over limited areas of A. mellifera. Otherwise open.

HEIGHT & FORM: Highest members average 12' to 14'. Remainder to 6'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris pilosa
Dinebra retroflexa

VEGETATION ENUMERATION PLOT No. 45.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia tortilis	16	2	* 1											19
Capparis decidua	10	3												13
Acacia adansonii	7	-	* 2	* 1										10
Acacia orfota	SB	6	MB	3	LB	-								9
Albizzia sericocephala	4	-	-	* 3										7
Acacia senegal	5	1												6
Balanites aegyptiaca	4	-	-	* 1										5
Acacia mellifera	SB	2	MB	1	LB	-								3
Acacia seyal	2	* 1												3
Dichrostachys glomerata	10													10
Cadaba farinosa	6													6
Boscia senegalensis	4													4
														95
NOTE:														
* These trees lapped at approx. 5' above ground level.														

VEGETATION ENUMERATION PLOT No. 45.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 50 miles from Kebkabiya on the Kutum road. East of road (cultivation to West of road).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4300'.

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level.

SOIL: Wind blown sand, now consolidated and superficially compacted. Colour light to mid brown. Under surface 'pan' (3" deep at most), the soil is loose and friable.

CANOPY & STOCKING: Very open 'bush'. Grass cover good.

HEIGHT & FORM: 5' at most.

USE: Grazed. Probably cultivated in the past.

GRASSES & HERBS:

Aristida sp. (abundant)
Chloris pilosa (frequent)
Eragrostis tremula (frequent)
Cenchrus biflorus, C. prieurii (abundant)
Cymbopogon proximus (local)
Cassia ashrek (locally abundant)

VEGETATION ENUMERATION PLOT No. 46 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	17	9	2	1										29
Acacia mellifera	SB	18	MB	7	LB	-								25
Acacia orfota	SB	13	MB	-	LB	-								13
Acacia tortilis	5	1												6
Acacia senegal	1	2												3
Balanites aegyptiaca	-	-	2											2
Ziziphus spina-christi	-	1												1
Boscia senegalensis	14	2												16
Cadaba farinosa	1													1
														96

VEGETATION ENUMERATION PLOT No. 46.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 59 miles from Kebkabiya on Kutum road. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4000'

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Gentle slope to south.

SOIL: Basically sedentary with a thin superficial layer of alluvium at the north end - the wash off a hill to the north.
Sedentary soil shallow - 12" to 18" - gritty, light brown in colour and with much quartz and granite stones in profile and on surface.
Alluvium chocolate brown, compacted on surface, 6" deep at most.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 15'.
Average 8'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis gangetica
Schmidtia pappophoroides

VEGETATION ENUMERATION PLOT No. 47.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia tortilis	28	-	-	-	* 3	4	1	2						38
Acacia mellifera	SB	28	MB	1	LB	-								29
Acacia orfota	SB	10	MB	-	LB	-								10
Balanites aegyptiaca	3	-	1	1	2	1								8
Capparis decidua	1	4	1	1										7
Commiphora africana	-	1												1
Boscia senegalensis	15	10	4											29
Grewia tenax	11													11
Cadaba farinosa	5													5
Cadaba glandulosa	3													3
														141

NOTE:

* Lopped for timber.

VEGETATION ENUMERATION PLOT No. 47.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis A. orfota.

POSITION: 70 miles from Kebkabiya. 2 miles East of Kutum. North of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3800'.

RAINFALL: 353 mms.

ASPECT & CONFIGURATION: Fully exposed. Level.

SOIL: Stony, sedentary grit soil. Light to mid brown in colour. Many pebbles and stones on surface. Of no great depth. Developed from a basement complex gneiss.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 26' (A. tortilis)
Average 7' to 8'.

USE: Poor grazing. Firewood and poles cut for use in Kutum town.

GRASSES & HERBS: Mainly poor thin Aristida spp.
Local Cymbopogon proximus.

VEGETATION ENUMERATION PLOT No. 48 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL.
Lannea humilis	101	4												105
Albizzia sericocephala	9	-	-	-	-	-	1							10
Balanites aegyptiaca	3													3
Capparis decidua	2	1												3
Commiphora africana	2	1												3
Acacia senegal	2													2
Acacia mellifera	SB	2	MB	-	LB	-								2
Boscia senegalensis	14	2	1											17
Cadaba farinosa	4	1												5
Cissus quadrangulus	4													4
Calatropis procera	2	1												3
Cordia crenata	1													1
														158

VEGETATION ENUMERATION PLOT No. 48.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles South of Kutum on the Fasher road. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3750'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: High lying sandy plateau, with igneous hills to North, South and West. Eastern exposure.

SOIL: Mid to red-brown sandy loam. Fairly deep (over 12'). Probably wind blown sand trapped by the hills, and there compacted in situ to form a loam soil. Run-off from the hills has consolidated the upper 3'. Below this the sand is fairly loose.

CANOPY & STOCKING: Very open. Abundant young regeneration of Lannea in small water channel.

HEIGHT & FORM: Maximum emergent 19' (Albizzia)
Average 5' to 7'.

USE: Grazed. Suitable for cultivation.

GRASSES & HERBS: Aristida spp.
Eragrostis sp. (? E. tremula)
Cenchrus biflorus (rare)
Cassia ashrek (woody H.)
(H) Geigeria alata.

VEGETATION ENUMERATION PLOT No. 49 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia mellifera	SB	24	MB	6	LB	-								30
Acacia tortilis	1	-	-	1	1	3	1	1						8
Acacia senegal	8													8
Bauhinia rufescens	3	2												5
Capparis decidua	1	2	1											4
Boscia senegalensis	9	1												10
														65

VEGETATION ENUMERATION PLOT No. 49.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 20 miles South of Kutum. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3700'

RAINFALL: 340 mms.

ASPECT & CONFIGURATION: Plain surrounded by low igneous hills.

SOIL: Drift sand over igneous rocks. Probably deep - 50' or more. Much mica particles in sand, also boulders of granite and mica schist on surface undergoing fairly rapid weathering.

CANOPY & STOCKING: Open.

HEIGHT & FORM: A. tortilis maximum 25'.
General average height, 6'.

USE: Grazed. Could be used for cultivation.

GRASSES & HERBS: Aristida spp. (abundant)
A. plumosa (occasional)
Cenchrus biflorus (frequent)

VEGETATION ENUMERATION PLOT No. 50 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Commiphora africana	24	8	4	3	1									40
Acacia mellifera	SB	5	MB	3	LB	5								13
Acacia orfota	SB	2	MB	2	LB	1								5
Acacia tortilis	-	-	-	-	1	1								2
Boscia senegalensis	11	3												14
Dichrostachys glomerata	10	3												13
Combretum aculeatum	8	1												9
Cissus quadrangulus	3													3
Grewia flavescens	2													2
Cadaba farinosa	1													1
														102

VEGETATION ENUMERATION PLOT No. 50.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 30 miles South of Kutum. West of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3600'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: In the Wana hills. Level, fairly high-lying.

SOIL: Sedentary, developed from igneous rocks and mica schists. Many rock fragments on surface, plus some outcrops of the parent rock. A poor grit soil, not deep, light to mid-brown in colour.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum of trees, 20'.
Bushes average 8' to 10'.

USE: Nil.

GRASSES & HERBS:
Aristida funiculata
A. adscensionis
Aristida sp.
Cenchrus biflorus
} all frequent.
Cymbopogon proximus (local clumps)

VEGETATION ENUMERATION PLOT No. 51 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia tortilis	1	12	2	3	1									19
Commiphora africana	1	1	3	3	2									10
Acacia mellifera	SB	1	MB	2	LB	2								5
Ziziphus spina-christi	2													2
Boscia senegalensis	3	2												5
Albizzia anthelmintica	1													1
Grewia tenax	1													1
														43

NOTE:
This plot is probably somewhat more open and less stocked than type.

VEGETATION ENUMERATION PLOT No. 51.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 40 miles South of Kutum.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3600'.

RAINFALL: 320 mms.

ASPECT & CONFIGURATION: In Wana hills. Fully exposed to West. Sheltered on other sides. Level.

SOIL: Drift sand over igneous rocks. Sand probably not less than 50' deep. Colour red brown to mid brown. Some indications of local surface pan formation (compacting with silt and clay particles) up to 6" deep.

CANOPY & STOCKING: Open to very open.

HEIGHT & FORM: Acacia tortilis up to 17'.
Commiphora average 13' to 14'.

USE: Nil. Might be cultivated if water available nearby.

GRASSES & HERBS:

	Aristida plumosa	(abundant)
	Cenchrus biflorus	(abundant)
	Eragrostis sp.	(frequent)
(H)	Geigeria alata	(frequent)

VEGETATION ENUMERATION PLOT No. 52 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia tortilis	13	12	8	1	-	1								35
Acacia adansonii	-	1	2	-	1	1	1							6
Acacia mellifera	SB	2	MB	3	LB	-								5
Cadaba farinosa	35													35
Boscia senegalensis	27	4												31
Dichrostachys glomerata	4	2												6
Grewia tenax	4													4
Capparis tomentosa	2													2
														124

VEGETATION ENUMERATION PLOT No. 52.

ASSOCIATION: Riparian Thornland.

POSITION: 50 miles South of Kutum. South of road. In watercourse and fringe.

SIZE: 220 x 22 yds = 1 acre.

ALTITUDE: 2500'.

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: Fairly sheltered to east and west by low sandhills. Khor runs north and south.

SOIL: To east and west, dunes of drift sand, now stabilised. Small valley of some material with a superficial layer of dark brown silt. Colour light to mid brown. Sand coarse, loose and friable. Depth of sand at least 50', and of surface silt accumulation, 5' (maximum).

CANOPY & STOCKING: Tendency towards local closure in thicket clumps. Otherwise open.

HEIGHT & FORM: Maximum 28' (A. adansonii)
Average 9' to 10'.

USE: Nil, except grazing.

GRASSES & HERBS: Echinochloa colona
Dactylatenium aegyptium
(H) Cassia ashrek (woody)
(H) Geigeria alata

VEGETATION ENUMERATION PLOT No. 53.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Maerua crassifolia	25													25
Guiera senegalensis	3													3
Acacia senegal	1													1
Boscia senegalensis	30													30
Albizzia anthelmintica	1													1
														60

VEGETATION ENUMERATION PLOT No. 53 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 60 miles South of Kutum. 2 miles NW of Fasher. NE of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2450'.

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Fully exposed. More or less level sand surface.

SOIL: Drift sand, now consolidated and cultivated. Deep, fairly loose and friable. Golden yellow on surface, becoming a mid-red-brown at 3'. Damp at 2'6" to 3'. (December 1951).

CANOPY & STOCKING: Canopy nil. Regrowth on abandoned cultivation, first year after abandonment.

HEIGHT & FORM: All small. 5' at most.

USE: Cultivated for 6 years up to 1950. Abandoned and allowed to revert to trees after 1950 harvest.

GRASSES & HERBS: Cenchrus biflorus } (abundant)
Cenchrus prieurii }
Eragrostis gangetica - occasional

Abundant wild regrowth of Pennisetum sp. grain.

VEGETATION ENUMERATION PLOT No. 54.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	7	2	1	1										11
Thespesia gartciana	5													5
Acacia adansonii	2	1												3
Acacia tortilis	1													1
Balanites aegyptiaca	-	-	1											1
Ziziphus spina-christi	1	1												2
Acacia orfota	SB	1	MB	-	LB	-								1
Acacia senegal	-	-	-	-	1									1
Acacia mellifera	SB	1	MB	-	LB	-								1
Capparis tomentosa	26													26
Cadaba farinosa	12													12
Grewia villosa	8													8
Dichrostachys glomerata	6													6
Cordia ovalis	4													4
Boscia senegalensis	1													1
														83

VEGETATION ENUMERATION PLOT No. 54.

ASSOCIATION: Cultivation Regrowth on Riparian Site.

POSITION: 10 miles east of Suni.
North of road.

SIZE: 110 x 11 yds. = ¼ acre.

ALTITUDE: 4490'

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: South exposure. Sheltered to east and to a less extent to west and north. Fairly level.

SOIL: Valley silt. Dark brown, sandy, of volcanic origin (i.e., derived from the break down of volcanic materials). Water washed stones and boulders of basalt on surface and in profile. Probably a deep soil. Well drained and free; easily worked.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 15' (A. seyal)
Average 6'.

USE: Abandoned cultivation site. Probably abandoned 5 to 7 years ago.

GRASSES & HERBS: Chloris sp.
Aristida spp.
Eragrostis sp.
Aristida adscensionis (dominant grass)
(H) Cassia ashrek.

VEGETATION ENUMERATION PLOT No. 55.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	25	13	6	3										47
Sclerocarya birrea	-	2	-	-	1	1								4
Combretum cordofanum	-	1	2	1										4
Maerua crassifolia	-	2	-	-	1									3
Boscia senegalensis	4	4	1											9
Combretum aculeatum	5	1												6
														73

VEGETATION ENUMERATION PLOT No. 55.

ASSOCIATION: Woodland on Sand.

POSITION: 3 miles North of Umm Hosh.
(41 miles North of Taweisha)

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: West side of sand dune. Moderate slope to west. Exposed North, South and West.

SOIL: Continental drift sand of great depth (over 150') overlying Nubian sandstone. Buff coloured, friable, and loose on the surface. Very free draining.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Trees 18' to 25'.
Average bush height 8'.

USE: Grazed. Not cultivated.

GRASSES & HERBS:

Aristida stipoides	(abundant)
Aristida hordacea	(abundant)
Schoenfeldia gracilis	(frequent)
Cenchrus barbatus	(frequent)
Cenchrus prieurii	(frequent)
Eragrostis major	(occasional)
Aristida pallida	(occasional)

VEGETATION ENUMERATION PLOT No. 56 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Lannea humilis	21	4	1											26
Commiphora africana	-	2	5	2	3									12
Guiera senegalensis	2	1												3
Maerua crassifolia	-	-	1	1										2
Sclerocarya birrea	-	-	-	-	-	1								1
Acacia senegal	-	-	-	-	1									1
Combretum cordofanum	-	-	-	1										1
Boscia senegalensis	4	1												5
Cissus quadrangulus	4													4
Combretum aculeatum	3													3
Grewia tenax	3													3
Grewia villosa	1													1
														62

VEGETATION ENUMERATION PLOT No. 56.

ASSOCIATION: Woodland on Sand.

POSITION: 7 miles South of Umm Hosh.
(31 miles North of Taweisha).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 315 mms.

ASPECT & CONFIGURATION: Top of sand dune. Fully exposed. Fairly sharp slopes to East and South.

SOIL: Continental sand of great depth.
Reddish yellow with some clay particles.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 25'.
Average 10' to 12'.

USE: Nil, except grazing.

GRASSES & HERBS:

Aristida spp. (abundant)
Aristida stipoides (frequent)
Aristida pallida (frequent)
Eragrostis tremula (frequent)
Cenchrus biflorus (frequent)
(H) Blepharis linariifolia (frequent)

VEGETATION ENUMERATION PLOT No. 57 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia senegal	63	4	2	3	2	1								75
Combretum cordofanum	8	1	2	1										12
Balanites aegyptiaca	4	-	1											5
Guiera senegalensis	3													3
Boscia senegalensis	10													10
Calatropis procera	3	1												4
Maerua crassifolia	3													3
														112

VEGETATION ENUMERATION PLOT No. 57.

ASSOCIATION: Woodland on Sand.

POSITION: 17 miles South of Umm Hosh. (3 miles South of Gabir). (21 miles North of Taweisha).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Fully exposed. Open and level.

SOIL: Continental sand, consolidated, with a slight superficial admixture of silt and clay particles. Mid brown in colour.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Large A. senegal to 25'.
Young natural regeneration to 5'.

USE: Old cultivation area. Abandoned some 5 years ago.

GRASSES & HERBS:

Aristida hordacea (frequent)
Cenchrus biflorus, Cenchrus prieurii (frequent)
Eragrostis sp. near E. tremula (frequent)
Aristida pallida (rare)
Schoenfeldia gracilis (rare)

VEGETATION ENUMERATION PLOT No. 58.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Lannea humilis	11	14	18	2	2									47
Combretum cordofanum	4	8	3	2	2	1								20
Guiera senegalensis	14	6												20
Balanites aegyptiaca	2	1	1											4
Bauhinia reticulata	-	-	2											2
Acacia senegal	-	1	-	1										2
Sclerocarya birrea	-	-	-	-	-	1								1
Boscia senegalensis	9													9
Grewia villosa	1													1
														106

VEGETATION ENUMERATION PLOT No. 58.

ASSOCIATION: Woodland on Sand.

POSITION: 27 miles South of Umm Hosh.
(11 miles North of Taweisha).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Exposed. Slight sidelong slope to West.

SOIL: Continental sand of dune. Red in colour with a fair silt and clay content.

CANOPY & STOCKING: Tends towards thicket closure in Lannea groves. Otherwise open.

HEIGHT & FORM: Lannea to 20' where canopy closing. Sclerocarya and larger Combretum to 30'. Guiera to 15'.

USE: Nil. Grazed perhaps.

GRASSES & HERBS:

Aristida spp. (frequent)
Cenchrus biflorus - (frequent)
Cenchrus prieurii - (frequent)
Schoenfeldia gracilis - (occasional)
Pennisetum sp. - (local)
(H) Blepharis linariifolia - (abundant)

VEGETATION ENUMERATION PLOT No. 59.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Guiera senegalensis	13	6												19
Lannea humilis	7	6	1	2										16
Combretum cordofanum	2	5	5	1	1									14
Acacia senegal	3	1	3											7
Balanites aegyptiaca	-	1	2	-	1									4
Bauhinia reticulata	-	1	2											3
Adansonia digitata	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Boscia senegalensis	6													6
Grewia tenax	4													4
														74

VEGETATION ENUMERATION PLOT No. 59.

ASSOCIATION: Woodland on Sand.

POSITION: 34 miles South of Umm Hosh.
(4 miles North of Taweisha).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: West side of sand dune.
Western exposure.

SOIL: Continental sand with superficial silt and clay content. Reddish brown colour for first 12" to 18", becoming lighter brown to yellow with increasing depth.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Trees to 20'. (*Adansonia* 40').
Bushes 7'.

USE: Nil except grazing.

GRASSES & HERBS: *Aristida* spp.
Eragrostis major
Schoenfeldia gracilis
Cenchrus biflorus

VEGETATION ENUMERATION PLOT No. 60 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Combretum cordofanum	8	9	6	3	-	1								27
Guiera senegalensis	11	7												18
Lannea humilis	3	1	1	1										6
Commiphora africana	-	-	-	2	1									3
Balanites aegyptiaca	-	-	-	1	-	1								2
Acacia senegal	-	-	2											2
Albizzia sericocephala	1	-	1											2
Terminalia macroptera	-	-	1	-	-	-	1							2
Bauhinia reticulata	-	-	-	1										1
Steriospermum kunthianum	-	-	-	-	1									1
Boscia senegalensis	3	1												4
														68

VEGETATION ENUMERATION PLOT No. 60.

ASSOCIATION: Woodland on Sand.

POSITION: 4 miles South of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 375 mms.

ASPECT & CONFIGURATION: Valley between two sand dunes. Exposed North and South. Sheltered by dunes to East and West.

SOIL: Continental sand. Reddish brown, surface very loose pure sand. Becomes firmer with admixture of clay particles at 6" to 9" depth.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Larger trees to 30'. Average tree height, 20'.

USE: Nil, except grazing.

GRASSES & HERBS:
Aristida spp. (frequent)
Cenchrus biflorus (frequent)
Cenchrus prieurii (occasional)
Eragrostis tremula (occasional)

VEGETATION ENUMERATION PLOT No. 61.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Combretum cordofanum	6	7	9	5										27
Acacia senegal	12	5	1	2										20
Guiera senegalensis	8	6												14
Boscia senegalensis	7	3												10
Stereospermum kunthianum	-	-	-	1	1									2
Sclerocarya birrea	-	-	-	-	-	1								1
Tamarindus indica	-	-	-	-	-	-	-	-	1					1
Combretum aculeatum	8													8
														83

VEGETATION ENUMERATION PLOT No. 61.

ASSOCIATION: Woodland on Sand.

POSITION: 11 miles South of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 390 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level plain.

SOIL: Continental sand with fair proportion of clay particles. Reddish brown with surface discolouration from burned grass ash.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Trees to 25'. (Exceptionally to 30' but not in this plot).

USE: Nil, except probably grazed. Grass burned off.

GRASSES & HERBS: (From adjoining unburned land)
Aristida spp.
Cenchrus spp.
Schmidtia poppophoroides

VEGETATION ENUMERATION PLOT No. 62.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Combretum cordofanum	6	5	1	2	1									15
Guiera senegalensis	4	3	1											8
Combretum ghasalense	-	3	3	1										7
Acacia senegal	-	1	2	1	-	1								5
Bauhinia rufescens	-	-	1	1										2
Terminalia macroptera	-	-	-	-	1	1								2
Lannea schimperi	-	-	-	-	-	1								1
Adansonia digitata	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Combretum aculeatum	3													3
														44

VEGETATION ENUMERATION PLOT No. 62.

ASSOCIATION: Woodland on Sand.

POSITION: 22 miles South of Taweisha.
(3 miles North of Heskanita).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 405 mms.

ASPECT & CONFIGURATION: Fairly level and exposed plain.

SOIL: Continental sand. Reddish brown, free and friable, deep. Surface layer grey-brown from grass ash.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Trees to 20' and 25'.

USE: Probably grazed. Grass largely burned-off. (January 1952).

GRASSES & HERBS: Aristida pallida
Aristida sp.
Cenchrus biflorus
Schmidtia pappophoroides
Cenchrus prieurii

VEGETATION ENUMERATION PLOT No. 63 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Balanites aegyptiaca	3	6	2	3	1	2								17
Combretum cordofanum	1	2	6	3	2									14
Acacia senegal	5	3	2	1										11
Guiera senegalensis	7	3												10
Maerua crassifolia	-	1	2	1										4
Ziziphus spina-christi	3													3
Bauhinia rufescens	-	-	-	-	1									1
Grewia tenax	3													3
														63

VEGETATION ENUMERATION PLOT No. 63.

ASSOCIATION: Woodland on Sand.

POSITION: 10 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: On West side of large sand dune. Gentle slope to West. Fairly exposed.

SOIL: Reddish brown continental sand with admixture of clay particles. Free drainage.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Balanites and Combretum to 30' and 26' respectively. A. senegal to 20'. Average overall height, 15' to 20'.

USE: Nil, except grazing. Similar sites are cultivated.

GRASSES & HERBS:

Aristida pallida	(frequent)
Aristida spp.	(abundant)
Cenchrus biflorus	(abundant)

VEGETATION ENUMERATION PLOT No. 64 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	15	8												23
Combretum cordofanum	-	3	3	3	1	1								11
Lannea humilis	5	2												7
Terminalia macroptera	1	1	-	1	1									4
Acacia senegal	-	1	2											3
Prosopis africana	-	-	-	1										1
Boscia senegalensis	10	4												14
Grewia villosa	5													5
														68

VEGETATION ENUMERATION PLOT No. 64.

ASSOCIATION: Woodland on Sand.

POSITION: 20 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Exposed.

SOIL: Continental sand of great depth. Reddish-yellow in colour. No profile development. Free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Terminalia and larger Combretum to 28'. Average height 15' to 20'.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida spp. (abundant)
Cenchrus biflorus (abundant)
Cenchrus prieurii (occasional)
Schmidtia pappophoroides (occasional)

VEGETATION ENUMERATION PLOT No. 65 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	4	8												12
Combretum cordofanum	-	1	2	2										5
Acacia senegal	-	2	2	1										5
Maerua crassifolia	-	-	1	1										2
Boscia salicifolia	-	-	1											1
Sclerocarya birrea	-	-	-	-	-	-	1							1
Boscia senegalensis	6	2												8
Grewia villosa	3													3
Grewia tenax	2													2
														39

VEGETATION ENUMERATION PLOT No. 65 .

ASSOCIATION: Woodland on Sand.

POSITION: 30 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 355 mms.

ASPECT & CONFIGURATION: Gently undulating sand dune.

SOIL: Continental sand of second sand invasion period. Deep and free; reddish-yellow colour; no profile.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 20'. Average 16'.

USE: Nil, except grazing.

GRASSES & HERBS:

Cenchrus biflorus	(abundant)
Cenchrus prieurii	(occasional)
Aristida spp.	(abundant)

VEGETATION ENUMERATION PLOT No. 66.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	6	MB	32	LB	12								50
Acacia seyal	7	2	1											10
Balanites aegyptiaca	6	2	-	-	-	-	1							9
Acacia orfota	SB	5	MB	2	LB	-								7
Acacia senegal	3													3
Commiphora africana	-	2	-	1										3
Ziziphus spina-christi	3													3
Capparis tomentosa	16													16
														101

VEGETATION ENUMERATION PLOT No. 66.

ASSOCIATION: Riparian Thornland.

POSITION: 34 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2300'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Fairly exposed level site on floor of wide valley.

SOIL: A sandy-silt cum clay, deposited by water action. Dark brown to grey brown in colour. Local superficial clay pan present in places, otherwise probably fairly free draining.

(A typical 'sn' to 'n' soil type).

CANOPY & STOCKING: Locally closed in thorn thicket at 9'.

HEIGHT & FORM: Large Balanites 27'.
Bush level 9' to 12'.

USE: Nil.

GRASSES & HERBS: sparse Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 67.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	7	8	6	2										23
Combretum cordofanum	-	3	7	2	-	1								13
Guiera senegalensis	6	3												9
Balanites aegyptiaca	2	3	1	-	1									7
Lannea humilis	6													6
Commiphora africana	-	-	-	1										1
Boscia senegalensis	3													3
														62

VEGETATION ENUMERATION PLOT No. 67 .

ASSOCIATION: Woodland on Sand.

POSITION: 40 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2275'

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Exposed. East side of stabilised sand dune.

SOIL: Continental sand, partially consolidated by admixture of silt and clay particles. Reddish yellow in colour. Fairly free and friable. Apparently free draining.

(A typical 's' soil type).

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 22'.
Average 14'.

USE: Nil, except probably grazing.

GRASSES & HERBS: Aristida spp.
Cenchrus spp.
Eragrostis major
Schoenfeldia gracilis
(H) Blepharis linariifolia

VEGETATION ENUMERATION PLOT No. 68.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	1	6	12	-	-	1								20
Balanites aegyptiaca	-	3	4	1	1									9
Maerua crassifolia	1	-	3	3										7
Combretum cordofanum	-	2	2	2										6
Guiera senegalensis	3													3
Sclerocarya birrea	-	1												1
Terminalia macroptera	-	-	1											1
Albizzia anthelmintica	1													1
														48

VEGETATION ENUMERATION PLOT No. 68.

ASSOCIATION: Woodland on Sand.

POSITION: 50 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2275'.

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating sandy plain.

SOIL: Yellow red continental sand of dune type. Superficially compacted locally by water redistributed silt and clay particles. Apart from these local patches, very free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 27'. Average 16'.

USE: Nil, except grazing. Could be cultivated.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii.
Aristida spp.
Aristida pallida
Aristida hordacea
Schoenfeldia gracilis

VEGETATION ENUMERATION PLOT No. 69.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	2	7	5	3	1	1								19
Guiera senegalensis	11													11
Combretum cordofanum	3	4	1	2										10
Balanites aegyptiaca	2	1	2	1	1									7
Maerua crassifolia	1	-	3	2										6
Combretum aculeatum	3													3
														56

VEGETATION ENUMERATION PLOT No. 69.

ASSOCIATION: Woodland on Sand.

POSITION: 60 miles WNW of Taweisha.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2275'.

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating plain of stabilised sand dunes.

SOIL: Reddish-yellow continental sand. Deep, loose and free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 18'. Average 14'.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida spp.
Cenchrus biflorus and C. prieurii
Eragrostis tremula
(H) Blepharis linariifolia

VEGETATION ENUMERATION PLOT No. 70 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	5	8	5	3										21
Balanites aegyptiaca	6	4	-	1	1									12
Guiera senegalensis	8	1												9
Maerua crassifolia	1	2	3	1										7
Combretum cordofanum	-	1	3	1										5
Ziziphus spina-christi	3													3
														57

VEGETATION ENUMERATION PLOT No. 70.

ASSOCIATION: Woodland on Sand.

POSITION: 70 miles WNW of Taweisha. 7 miles SE of Wada'a.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2250'

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating stabilised sand dune country.

SOIL: Reddish yellow deep sand. Loose and free. No profile development.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 20'. Average 13'.

USE: Nil, except grazing. Might be cultivated.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii
Aristida pallida
Aristida stipoides

VEGETATION ENUMERATION PLOT No. 71.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	18	MB	42	LB	3								63
Balanites aegyptiaca	4	1	-	-	1									6
Capparis decidua	2	2												4
Boscia senegalensis	7													7
Cadaba glandulosa	6													6
														86

VEGETATION ENUMERATION PLOT No. 71.

ASSOCIATION: Riparian Thornland.

POSITION: 2 miles South of Wada'a on the Wadi el Ku flood plain.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2250'

RAINFALL: 340 mms.

ASPECT & CONFIGURATION: Fairly exposed. Wide level flood plain, here about 5 miles wide.

SOIL: A rich brown sandy silt. Probably of appreciable depth (50' or more).
Sufficiently high clay content to cause slight cracking when the area dries out after the rains season.

CANOPY & STOCKING: Closed at 8' in thorn thicket over a large part of the plot.

HEIGHT & FORM: Maximum 23' (Balanites)
Average 8' to 9'.

USE: Nil.

GRASSES & HERBS: Very poor thin Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 72 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	9	MB	18	LB	-								27
Acacia orfota	SB	16	MB	1	LB	-								17
Acacia tortilis	7	3	1											11
Capparis decidua	2	3												5
Commiphora africana	3	-	-	1										4
Acacia seyal	2	1												3
Cordia crenata	4													4
														71

VEGETATION ENUMERATION PLOT No. 72.

ASSOCIATION: Riparian Thornland.

POSITION: 10 miles South of Wada'a on the Wadi el Ku plain.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2250'.

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Exposed. Wide level flood plain.

SOIL: A brown sandy silt similar in every detail to that of the preceeding plot.

(Both these soils are typical of 'n' sites).

CANOPY & STOCKING: Open. Locally closed over small areas.

HEIGHT & FORM: Average 8' to 9'.

USE: Nil.

GRASSES & HERBS: Echinochloa colona

VEGETATION ENUMERATION PLOT No. 73.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	5	MB	18	LB	4								27
Acacia tortilis	3	2	3											8
Balanites aegyptiaca	-	3	1	2	1									7
Acacia senegal	-	1	2											3
Boscia senegalensis	6	1												7
Cordia crenata	3													3
														55

VEGETATION ENUMERATION PLOT No. 73 .

ASSOCIATION: Riparian Thornland.

POSITION: 20 miles South of Wada'a on the Wadi el Ku plain.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2245'.

RAINFALL: 380 mms.

ASPECT & CONFIGURATION: Exposed. Wide level flood plain.

SOIL: A brown sandy silt similar to the two previous plots. A nearby well showed the following profile:-

0-15' - Mid to dark brown silt.
15'-48' - A lighter brown silt with a higher content of coarse sand.
48'-52' - Coarse golden yellow sand.
52' + - Dark brown clay. Water bearing strata is the 4' bed of sand above 52'.

CANOPY & STOCKING: Locally closed in thorn thicket over small areas. Otherwise open.

HEIGHT & FORM: Maximum 25' (Balanites)
Average bush level is 9'.

USE: Nil.

GRASSES & HERBS: Thin poor Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 74.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	18	13												31
Acacia senegal	-	4	11	2										17
Balanites aegyptiaca	-	-	-	-	-	1								1
Commiphora africana	-	-	-	-	1									1
Albizzia sericocephala	-	1												1
Boscia senegalensis	3													3
Grewia tenax	2													2
														56

VEGETATION ENUMERATION PLOT No. 74.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 30 miles South of Wada'a. To the West of the Wadi el Ku plain.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2240'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Fairly level and exposed. Crest of a broad sand dune.

SOIL: Continental sand. Reddish-yellow in colour, loose on surface, but becoming firm at 6" depth and moist at 3'6".

CANOPY & STOCKING: Open thorn savanna.

HEIGHT & FORM: Average 18'.

USE: Nil, except grazing.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii
Eragrostis tremula
Aristida hordacea and A. pallida
Aristida sp.

VEGETATION ENUMERATION PLOT No. 75 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24↑	TOTAL
Acacia senegal	2	3	18	2										25
Balanites aegyptiaca	6	3	2	4	2	1								18
Adansonia digitata	-	-	-	-	-	-	-	-	-	-	-	-	* 2	2
Combretum aculeatum	12													12
Boscia senegalensis	7													7
														64

NOTE:

* one root system dividing at ground level into two trees.

VEGETATION ENUMERATION PLOT No. 75.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 40 miles South of Wada'a. 19 miles North of Mahugeria.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2235'.

RAINFALL: 435 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level area of sand with minor surface undulations.

SOIL: Hard sand ('s' soil type). Reddish brown continental sand with a fair proportion, in the upper 18" to 2', of silt and clay particles. Below that level free loose reddish yellow sand.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Balanites to 25', average 20'.
A. senegal to 20', average 15' to 18'.

USE: Nil, except grazing.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii.
Aristida spp.
Schoenfeldia gracilis
Cymbopogon proximus (local clumps)

VEGETATION ENUMERATION PLOT No. 76.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	3	8	8	3										22
Guiera senegalensis	13	4												17
Balanites aegyptiaca	6	4	2	-	1									13
Ziziphus spina-christi	✕ 7													7
Acacia mellifera	SB	3	MB	-	LB	-								3
Combretum aculeatum	4													4
														66

NOTE:

✕ All shoots from the one root-stock.

VEGETATION ENUMERATION PLOT No. 76.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 50 miles South of Wada'a. 9 miles North of Mahugeria.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2230'.

RAINFALL: 460 mms.

ASPECT & CONFIGURATION: Fairly sheltered. Fairly level area of sand. Minor surface undulations. Hollow between two old dunes.

SOIL: Hard sand ('s' type). Continental sand lying in such a position topographically, and under such a rainfall that it receives a significant amount of silt and clay particles by water carriage. Colour yellow brown, leaving a grey smear when rubbed in the hands.

CANOPY & STOCKING: Not closed, but stocking fairly dense giving good cover.

HEIGHT & FORM: Average of A. senegal 18'.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida plumosa and A. stipoides
Cenchrus biflorus
Schmidtia pappophoroides

VEGETATION ENUMERATION PLOT No. 77.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	8	5	2	1	2									18
Balanites aegyptiaca	-	1	2	1										4
Guiera senegalensis	3													3
Combretum cordofanum	-	-	1	1										2
Boscia senegalensis	2	1												3
														30

VEGETATION ENUMERATION PLOT No. 77 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 5 miles North of Umm Marahig on the Fasher-Mellit road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2600'.

RAINFALL: 295 mms.

ASPECT & CONFIGURATION: Level. Slightly sheltered to West by low hills $\frac{1}{3}$ mile distant. Otherwise fully exposed.

SOIL: Dune sand. Yellow red in colour, very loose surface. Deep and free draining.

(A typical 'ss' soil type).

CANOPY & STOCKING: Open.

HEIGHT & FORM: To 20' for all main species.

USE: Grazed.

GRASSES & HERBS: Aristida spp.
Cenchrus biflorus and C. prieurii
Eragrostis sp.

VEGETATION ENUMERATION PLOT No. 78.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	2	8	4	6	1									21
Balanites aegyptiaca	1	2	3	1	-	1								8
Capparis decidua	-	2	1											3
Boscia senegalensis	3	2												5
														37

VEGETATION ENUMERATION PLOT No. 78 .

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 15 miles North of Umm Marahig on the Mellit road. (5 miles South of Mellit).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2700'.

RAINFALL: 290 mms.

ASPECT & CONFIGURATION: Fully exposed. Gentle slope to North.

SOIL: Dune sand. Reddish yellow colour. Surface 9" friable and loose, below that depth fairly compacted. Free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Balanites to 23'; A. senegal to 18'.

USE: Grazed.

GRASSES & HERBS: Aristida spp.
Cenchrus biflorus and C. prieurii

VEGETATION ENUMERATION PLOT No. 79 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia senegal	11	7												18
Balanites aegyptiaca	1	2	4	2	1									10
Acacia orfota	SB	9	MB	-	LB	-								9
Ziziphus spina-christi	8													8
Maerua crassifolia	2	1	1											4
														49

VEGETATION ENUMERATION PLOT No. 79.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 5 miles from Mellit on the Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2750'.

RAINFALL: 280 mms.

ASPECT & CONFIGURATION: Fully exposed, open site.

SOIL: Fairly hard red sand. Probably ferruginised surface layer. Light yellow brown at 15" depth. Both horizons show consolidation and compacting of the sand.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Balanites to 20' (exceptionally 25'). Remainder of species average 8'.

USE: This type of land used for cultivation. This plot does not appear to have been cultivated either ever, or for a very long time.

GRASSES & HERBS: Aristida spp.
Eragrostis tremula

VEGETATION ENUMERATION PLOT NO. 80.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	9	MB	23	LB	3								35
Commiphora africana	1	7	5	1										14
Acacia orfota	SB	4	MB	-	LB	-								4
Ziziphus spina-christi	3													3
Maerua crassifolia	-	-	1											1
Boscia senegalensis	7	2												9
														66

VEGETATION ENUMERATION PLOT No. 80.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 15 miles from Mellit on the Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3100'.

RAINFALL: 280 mms.

ASPECT & CONFIGURATION: Open and exposed. Fairly high lying plateau.

SOIL: Thin, stony, gravelly soil. A typical sedentary soil overlying basement complex measures at no great depth.

CANOPY & STOCKING: Locally closed at 10' in consociations of A. mellifera.

HEIGHT & FORM: Average 10' to 11'.

USE: Nil.

GRASSES & HERBS: All poor and thin.

Aristida spp.
Cymbopogon proximus
Eragrostis major

VEGETATION ENUMERATION PLOT No. 81.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	8	MB	13	LB	1								22
Lannea humilis	13	1												14
Acacia orfota	SB	5	MB	2	LB	-								7
Capparis decidua	1	1	3											5
Balanites aegyptiaca	-	2	-	-	1									3
Commiphora africana	-	2												2
Boscia senegalensis	7	2												9
														62

VEGETATION ENUMERATION PLOT No. 81.

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 26 miles from Mellit on the Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3300'.

RAINFALL: 280 mms.

ASPECT & CONFIGURATION: Open. Fully exposed. High lying plateau.

SOIL: Basement complex sedentary grit soil (probably of no great depth) covered by a thin layer of sand now compacted into a firm surface. Maximum depth of sand cover 12" to 18".

CANOPY & STOCKING: Generally open. Local closure at 8' in A. mellifera thickets.

HEIGHT & FORM: Balanites to 20'. Bush level 8' to 10'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis spp.

VEGETATION ENUMERATION PLOT No.82 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia niotica	8	-	6	11	2	2								29 (Approx. ½ acre)
Acacia tortilis	4	-	-	1	1									6
Acacia mellifera	SB	2	MB	3	LB	-								5
Capparis decidua	-	1	1	1								Approx. ½ acre.		3
Boscia senegalensis	1	3												4
														29 18 / 47

VEGETATION ENUMERATION PLOT No. 82 .

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 35 miles from Mellit on Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3550'.

RAINFALL: 290 mms.

ASPECT & CONFIGURATION: Fairly sheltered hollow with a gentle slope to the east.

SOIL: A cracking silty-clay (fairly high clay content) in the valley basin (approx. ½ acre growing A. nilotica). On the side slope a thin gravelly soil. A typical basement complex sedentary soil. Light reddish brown in colour. Compacted.

CANOPY & STOCKING: A. nilotica closed canopy at 20'.
Away from the basin the canopy is open.

HEIGHT & FORM: Highest trees to 30', average 20'.
Average bush level 8'.

USE: Grazed.

GRASSES & HERBS: In the basin nil; all grazed.
Probably only Echinochloa colona after annual flooding.
Thin Aristida spp. on the side slope.

VEGETATION ENUMERATION PLOT No. 83.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Maerua crassifolia	8	12	4	1										25
Guiera senegalensis	3													3
Acacia senegal	-	1												1
Albizzia sericocephala	1													1
Boscia senegalensis	19	9	2											30
														60

NOTE:
This is for a small watercourse. Open plains carry the same species, but the stocking is about 25% of above only.

VEGETATION ENUMERATION PLOT No. 83.

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 47 miles from Mellit on the Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3800'

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Small shallow watercourse in open plain. Fully exposed.

SOIL: A light brown to grey sandy-silt. Non cracking.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 10'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Cenchrus biflorus and C. prieurii
Eragrostis sp.
Cymbopogon proximus.
(H) Geigeria alata.

VEGETATION ENUMERATION PLOT No. 84 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	12	6	5	3	2									28
Acacia mellifera	SB	8	MB	18	LB	-								26
Acacia tortilis	2													2
Balanites aegyptiaca	-	-	1											1
Boscia senegalensis	6	5												11
														68

VEGETATION ENUMERATION PLOT No. 84.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 66 miles from Mellit on Kutum road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3800'.

RAINFALL: 325 mms.

ASPECT & CONFIGURATION: Exposed, fairly level plateau.

SOIL: Thin gravel covering Nubian sandstone and basement complex series. Surface hard and compacted with much loose water-washed gravel.

CANOPY & STOCKING: Generally open. Thicket closure over small areas.

HEIGHT & FORM: Mazimum 12'. Average 10'.

USE: Nil.

GRASSES & HERBS: Aristida spp. Poor and thin cover.
(H) Geigeria alata (occasional)

VEGETATION ENUMERATION PLOT No. 85 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	6	MB	21	LB	3								30
Commiphora africana	3	1	6	3	1									14
Acacia tortilis	4	2	-	1										7
Capparis decidua	-	1	1											2
Acacia orfota	SB	3	MB	-	LB	-								3
Boscia senegalensis	5	3												8
														64

VEGETATION ENUMERATION PLOT No. 85.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 75 miles from Mellit, 5 miles NE of Kutum.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3800'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Exposed. Undulating much broken plateau.

SOIL: Thin gravel covering on basement complex rocks. A poor sedentary soil typical of large areas in this region.

CANOPY & STOCKING: Closed over wide stretches where the stocking is sufficiently dense.

HEIGHT & FORM: Maximum 12'. Canopy, where closed, does so at 8' to 9'.

USE: Nil.

GRASSES & HERBS: Thin covering of Aristida spp. (Aristida adscensionis and others).

VEGETATION ENUMERATION PLOT No. 86 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	3	MB	9	LB	11								23
Acacia tortilis	7	2	7	3	1									20
Acacia orfota	SB	2	MB	1	LB	-								3
Acacia senegal	-	-	2											2
Capparis decidua	-	-	1	1										2
Cadaba farinosa	3													3
														53

VEGETATION ENUMERATION PLOT No. 86.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 11 miles NW of Kutum on the Dor road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3700'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Fairly exposed. Gentle slope to south.

SOIL: Basement complex rocks with thin gritty soil covering.

(See photo No. 10).

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 20'.
Average 9' to 12'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis sp.

VEGETATION ENUMERATION PLOT No. 87 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	8	MB	18	LB	3								29
Acacia tortilis	7	2	2											11
Commiphora africana	2	1	3	2	-	1								9
Boscia senegalensis	3	3												6
														66

VEGETATION ENUMERATION PLOT No. 87.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 8 miles NW of Dor on the Kutum - Dor - Umm Buru road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3400'.

RAINFALL: 340 mms.

ASPECT & CONFIGURATION: Exposed. Undulating plateau.

SOIL: Sedentary grit soil developed on basement complex granites.
Reddish brown colour, with much granite fragments and quartzes on the surface.

CANOPY & STOCKING: Generally open. Small local areas of thicket closure present.

HEIGHT & FORM: Average 8' to 10'.

USE: Nil.

GRASSES & HERBS: Thin, poor cover of Aristida spp.

VEGETATION ENUMERATION PLOT No. 88 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	-	8	4	3										15
Acacia tortilis	-	-	-	1	1									2
Balanites aegyptiaca	-	-	1	-	-	1								2
Maerua crassifolia	-	-	1											1
Boscia senegalensis	4	8												12
														32

VEGETATION ENUMERATION PLOT No. 88 .

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 18 miles NW of Dor on the Umm Buru road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3100'

RAINFALL: 335 mms.

ASPECT & CONFIGURATION: Northern exposure. Sand collar on North side of low hill.

SOIL: Wind blown sand (derived from the breakdown of Nubian sandstone rocks) lying on top of basement complex measures. Probable depth up to 50'.

(An 'ss' or 's' soil type).

CANOPY & STOCKING: Very open.

HEIGHT & FORM: 17'.

USE: Probably grazed.

GRASSES & HERBS: Fairly good cover of
Eragrostis sp. (abundant)
Aristida sp. (frequent)

VEGETATION ENUMERATION PLOT No. 89.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	2	MB	6	LB	8								16
Acacia tortilis	5	1	2											8
Maerua crassifolia	-	1	2											3
Boscia senegalensis	3	4	2											9
Cissus quadrangulus	1													1
														37

VEGETATION ENUMERATION PLOT No. 89.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 32 miles NW of Dor on the Umm Buru road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3100'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level, traversed by small shallow runnels going south-east.

SOIL: Sand, compacted on surface by clay wash. Reddish-brown colour. Golden yellow in colour where loosened (as in car tracks). Water washed pebbles of Nubian sandstone on surface.

The presence of A. mellifera indicates that the sand is of no great depth, as does the surface deposition of silt particles.

CANOPY & STOCKING: Generally open. Very few small areas of thicket closure.

HEIGHT & FORM: Maximum 12'. Average to 8' to 19'.

USE: Nil.

GRASSES & HERBS: Scattered tussocks of Panicum turgidum.
(H) Blepharis edulis locally occasional.

VEGETATION ENUMERATION PLOT No. 90 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia albida	5	1	-	-	-	-	1	-	-	-	-	-	3	10
Balanites aegyptiaca	-	1	2	3	-	1	1							8
Ziziphus mucronata	1	-	-	-	-	-	1	-	-	-	1	1		4
Acacia tortilis	-	-	-	1	1	-	1							3
														25

NOTE:

Compare plot 93.

This plot (90) is a better average picture of Wadi vegetation in this region.

VEGETATION ENUMERATION PLOT No. 90.

ASSOCIATION: Riparian Thorn Forest.

POSITION: Wadi Umm Buru, south bank, some 3 miles East of the village of Umm Buru.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'

RAINFALL: 320 mms.

ASPECT & CONFIGURATION: Open and exposed.

SOIL: A sandy silt. Light brown in colour, light and friable in texture. Not sufficient clay content to cause surface compacting and cracking on drying-out.

CANOPY & STOCKING: Generally fairly open.

HEIGHT & FORM: Maximum 40' for A. albida.

USE: Grazed.

GRASSES & HERBS: Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 91 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	4	MB	14	LB	-								18
Acacia mellifera	SB	4	MB	-	LB	-								4
Capparis decidua	-	-	1											1
Acacia tortilis	-	Nil	in	this	plot	-								-
Boscia senegalensis	-	2												2
														25

NOTE:
Most of the vegetation is confined to small water runnels. The stocking in the plot is average for these conditions.

VEGETATION ENUMERATION PLOT No. 91 .

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 14 miles North of Umm Buru on the Furawaiya road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2950'

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: High plateau. Exposed.

SOIL: A sedentary grit soil with many pebbles on the surface. Probably derived from basement complex rocks as most of the pebbles are quartz.

CANOPY & STOCKING: Nil canopy. Very open. Poor stocking.

HEIGHT & FORM: Capparis maximum 10'.
Other species maximum 7', average 5'.

USE: Nil.

GRASSES & HERBS: Aristida spp. (2 spp.)
Cymbopogon proximus in small water channels.
(H) Geigeria alata.

VEGETATION ENUMERATION PLOT No. 92 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Maerua crassifolia	8	6	1											15
Capparis decidua	-	1	2											3
														18

VEGETATION ENUMERATION PLOT No. 92.

ASSOCIATION: Maerua - Capparis. Semi-desert scrub.

POSITION: 10 miles North of Furawaiya wells.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2930'.

RAINFALL: 300 mms.

ASPECT & CONFIGURATION: Fully exposed. Undulating sand plain.

SOIL: Sand of first sand invasion. Fairly compacted. Light yellow in colour.

CANOPY & STOCKING: Very scattered bushes in a grass plain.

HEIGHT & FORM: Maximum 12'. Average 5'.

USE: Grazed by camels.

GRASSES & HERBS:

Cenchrus biflorus	abundant - the commonest grass.
Aristida plumosa	occasional, locally frequent.

Grass cover dense, to 18" high.

((H) Geigeria alata local, in small depressions. Not present in the plot.)

VEGETATION ENUMERATION PLOT No. 93 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	19	6	5	4	6	3	2							45
Acacia tortilis	1	1	3	4	7	3	2	2	-	1	-	-	2	26
Ziziphus mucronata	-	-	-	-	-	-	-	-	-	1	-	-	2	3
Acacia albida	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Maerua crassifolia	-	-	-	-	-	1	-	-	-	1				2
														78

NOTE:
Most of the young Balanites show damage through grazing.

VEGETATION ENUMERATION PLOT No. 93 .

ASSOCIATION: Riparian Thorn Forest.

POSITION: On the Wadi Furawaiya about ½ mile to the South of the wells and village.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2940'.

RAINFALL: 305 mms.

ASPECT & CONFIGURATION: Sheltered to the NW by a rocky hill (Nubian sandstone). Exposed on all other sides.

SOIL: A very sandy silt. Much mica present. Light brown in colour, light and very friable in texture.

CANOPY & STOCKING: Closed at about 25'.

HEIGHT & FORM: Maximum 35' (exceptionally 40'). Average, as above, 25'.

USE: Grazing and shade for animals awaiting watering at the wells.

GRASSES & HERBS: Echinochloa colona, said to be abundant. All grazed off.

Panicum turgidum, occasional to rare.

VEGETATION ENUMERATION PLOT No. 94.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	5	MB	9	LB	-								14
Acacia tortilis	8	3	1	1										13
Acacia mellifera	SB	3	MB	7	LB	-								10
Capparis decidua	-	-	3	2										5
Maerua crassifolia	-	1	3	1										5
Commiphora africana	-	2												2
Boscia senegalensis	5	4	2											11
														60

VEGETATION ENUMERATION PLOT No. 94.

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 14 miles SW of Furawaiya on the Karnoi road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2945'.

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: Gently undulating. General slope to South and West.

SOIL: A sandy-loam. Yellow to light brown in colour. Slight hardening of the surface. This pan ($\frac{1}{2}$" thick at most) readily breaks up, and is not impermeable to water. Under the pan the soil is very friable with little or no profile development.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 12'.
Average 9' to 10'.

USE: Similar land nearby is cultivated.

GRASSES & HERBS: Aristida spp.
Panicum turgidum
(H) Geigeria alata

VEGETATION ENUMERATION PLOT No. 95.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	3	MB	17	LB	-								20
Acacia orfota	SB	5	MB	3	LB	1								9
Acacia tortilis	-	3	2											5
Maerua crassifolia	-	3	1											4
Boscia senegalensis	3	4												7
														45

VEGETATION ENUMERATION PLOT No. 95 .

ASSOCIATION: Acacia mellifera - A. orfota - Boscia.

POSITION: 24 miles SW of Furawaiya on the Karnoi road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2950'.

RAINFALL: 315 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level.

SOIL: A sandy loam, generally very similar in appearance to that of the preceeding plot, except that the surface pan is not so evident.

CANOPY & STOCKING: Open. Locally closed in A. mellifera thicket at 7'.

HEIGHT & FORM: Maximum 15'.
Average 9'.

USE: Similar ground is used for cultivation.

GRASSES & HERBS: Panicum turgidum
(H) Geigeria alata

VEGETATION ENUMERATION PLOT No. 96 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	23	MB	19	LB	-								42
Acaciatortilis	8	4												12
Acacia mellifera	SB	2	MB	6	LB	2								10
Capparis decidua	-	2	3	1										6
Maerua crassifolia	-	-	1											1
Balanites aegyptiaca	-	1												1
Boscia senegalensis	3	4												7
														79

VEGETATION ENUMERATION PLOT No. 96 .

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 8 miles West of Karnoi on the Tini road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2965'.

RAINFALL: 325 mms.

ASPECT & CONFIGURATION: Exposed. Gentle sidelong slope to West.

SOIL: A consolidated sand, with a fairly high silt content. Leaves grey streaks when rubbed in the hands. Probably of no great depth.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 12' to 14'.
Average 10' to 11'.

USE: Nil. (Similar sites are cultivated).

GRASSES & HERBS: *Aristida* spp.

VEGETATION ENUMERATION PLOT No. 97.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	5	9	13	4	-	1								32
Acacia mellifera	SB	3	MB	1	LB	-								4
Acacia senegal	-	1												1
Boscia senegalensis	14	9	1	2										26
														63

VEGETATION ENUMERATION PLOT No. 97.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 20 miles West of Karnoi on the Tini road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2980'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Fully exposed. Fairly level.

SOIL: A light sandy loam. Yellow in colour and very friable.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 12'.
Average 10'.

USE: Nil. (Similar sites are cultivated).

GRASSES & HERBS: Aristida spp. (frequent)
Cenchrus biflorus and C. prieurii (frequent)

(H) Geigeria alata (frequent)

VEGETATION ENUMERATION PLOT No. 98 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	1	3	4	4	-	1	1							14
Balanites aegyptiaca	7	3	1	-	-	1								12
Acacia tortilis	-	-	1	-	3	2	3	1						10
Acacia adansonii	-	-	-	2	-	-	2	1	-	1	-	-	1	7
Ziziphus mauritiana	-	-	1	3	-	-	-	-	-	1	-	-	1	6
Acacia mellifera	3	1	1	1										6
Capparis decidua	1	2	3											6
Acacia albida	-	-	-	-	-	-	1	-	-	-	-	1	1	3
Ziziphus mucronata	-	-	-	-	-	1	-	-	-	-	-	-	1	2
Ziziphus spina-christi	-	2												2
Grewia tenax	7													7
Cordia ovalis	2													2
Dichrostachys glomerata	1													1
Cadaba glandulosa	1													1
Cadaba farinosa	-	1												1
														80

VEGETATION ENUMERATION PLOT No. 98 .

ASSOCIATION: Riparian Thorn Forest.

POSITION: On the Wadi Tini (= Howar) just North of Tini wells.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Exposed North and South along the length of the Wadi.

SOIL: Coarse gritty sandy silt. A comparatively narrow valley contained within high (50') rock walls.

CANOPY & STOCKING: Locally closed at 35'.

HEIGHT & FORM: Maximum 45'.

USE: Grazed.

GRASSES & HERBS: Echinochloa colona (all grazed off)

VEGETATION ENUMERATION PLOT No. 99.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	8	6	7	3	1	2								27
Acacia mellifera	SB	-	MB	3	LB	-								3
Boscia senegalensis	9	13	3											25
														55

VEGETATION ENUMERATION PLOT No. 99.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 9 miles South of Tini on the Tundubai road. East of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3020'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Fully exposed. High lying level sand plateau.

SOIL: Sand. Yellow-brown in colour and fairly hard, (i.e. compacted) superficially. Probably deep.

CANOPY & STOCKING: Fairly open. Say 0.6 closure.

HEIGHT & FORM: Maximum 15'.
Average 11'.

USE: Nil.

GRASSES & HERBS: Cenchrus biflorus (abundant)
Cymbopogon proximus (locally frequent in patches of harder soil).
(H) Geigeria alata (occasional)

VEGETATION ENUMERATION PLOT No. 100.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia nilotica	-	1	3	1	3	1	2	1	-	2	1			15
Acacia adansonii	-	-	-	1	2	2	1	-	1					7
Acacia seyal	-	-	1	3	-	-	1							5
Acacia albida	2	1	-	-	-	-	-	-	-	-	-	-	1	4
Acacia mellifera	-	2	1											3
Balanites aegyptiaca	3													3
Boscia senegalensis	6	4	1											11
Dichrostachys glomerata	2	2												4
Grewia tenax	4													4
Cadaba glandulosa	2													2
														58

VEGETATION ENUMERATION PLOT No.100.

ASSOCIATION: Riparian Thorn Forest.

POSITION: East (= Sudan) shore of Lake Undur.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3010'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Fairly exposed. Shore slopes gradually to East.

SOIL: A sandy clay. Three different types of soil can be recognised. Working from the lake edge towards the high land these are:-

(1) Cracking silt with fair proportion of clay. Bears A. nilotica. Here 40 yds. wide.

(2) Sandy silt. Mid brown in colour. Dominant vegetation A. adansonii, A. seyal and A. albida. 100 yds. wide.

(3) Reddish yellow dune sand with slight silt content. Dominant vegetation, Boscia senegalensis.

CANOPY & STOCKING: Closed in area (1); nearly closed in area (2); very open in area (3).

HEIGHT & FORM: (1) To 35'; (2) To 25' - 30'; (3) To 10'.

USE: Some grazing, but mainly shade for watering animals.

GRASSES & HERBS: (1) and (2) Echinochloa colona

(3) Cenchrus spp.
Panicum turgidum
Dinebra retroflexa.

VEGETATION ENUMERATION PLOT No. 101.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	4	MB	13	LB	8								25
Commiphora africana	3	1	1	3	4									12
Maerua crassifolia	1	2	1											4
Boscia senegalensis	8	3												11
Cadaba farinosa	7													7
Cadaba glandulosa	3													3
														62

VEGETATION ENUMERATION PLOT No. 101.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 13 miles South of Tini (5 miles North of Tundubai).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3020'.

RAINFALL: 350 mms.

ASPECT & CONFIGURATION: Sand dune, gently sloping to East. Exposed North, South and East.

SOIL: A fairly soft surface sand. Consolidated at a depth of 6" by a slight clay pan. Permeable. Light and friable.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 14'. Average 10'.

USE: Nearby land of similar type cultivated.

GRASSES & HERBS:

	Cenchrus biflorus	(abundant)
	Dinebra retroflexa	(frequent)
	Eragrostis sp.	(occasional)
	Cymbopogon proximus	locally occasional.
(H)	Geigeria alata	locally occasional.

VEGETATION ENUMERATION PLOT No. 102.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	6	MB	19	LB	13								38
Commiphora africana	10	3	4	7	2	2								28
Balanites aegyptiaca	-	-	-	1										1
Maerua crassifolia	-	-	1											1
Albizzia sericocephala	-	1												1
Boscia senegalensis	4	6												10
														79

VEGETATION ENUMERATION PLOT No. 102.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 9 miles South of Tundubai on the Kulbus road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'.

RAINFALL: 360 mms.

ASPECT & CONFIGURATION: Level and exposed. Fairly high lying.

SOIL: A fairly hard, probably shallow, sandy soil. Admixture of silt particles, giving cohesion, and some grit.

CANOPY & STOCKING: Approx. 0.7 closure overall. A well stocked area, representative of wide stretches of this type of vegetation and association.

HEIGHT & FORM: Maximum 15'.
Average 10' to 12'.

USE: Nil.

GRASSES & HERBS: *Aristida* spp.

VEGETATION ENUMERATION PLOT No. 103.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	33	12	1	2										48
Commiphora africana *	5	2	-	1										8
Acacia mellifera *	SB	6	MB	1	LB	-								7
Balanites aegyptiaca	3	-	1	-	1									5
Acacia orfota	SB	3	MB	-	LB	-								3
Maerua crassifolia	2													2
														73

NOTE:-

* Occur only near the rock base of the hill.

VEGETATION ENUMERATION PLOT No. 103.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 27 miles South of Tundubai on the Kulbus road. (15 miles North of Kulbus).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2900'.

RAINFALL: 375 mms.

ASPECT & CONFIGURATION: Sloping south-west. Sheltered to the North and East by hills.

SOIL: Sand collar round an igneous intruded hill. Comparatively well consolidated. Surface loose where worked, otherwise firm. Light brown to yellow in colour. Permeable and friable.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 18' (Balanites)
Average 13'.

USE: Could probably be cultivated.

GRASSES & HERBS: Cenchrus biflorus (abundant)
Aristida spp. (frequent)
Eragrostis sp. (occasional)

VEGETATION ENUMERATION PLOT N5. 104.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	8	MB	18	LB	7								33
Ziziphus spina-christi	12	-	1											13
Acacia tortilis	8	3												11
Commiphora africana	-	2	1	2	3	1								9
Albizzia sericocephala	4	1	2	1										8
Capparis decidua	-	4	1											5
Balanites aegyptiaca	-	2	1	2										5
Acacia orfota	SB	3	MB	-	LB	-								3
Boscia senegalensis	12	3												15
														102

VEGETATION ENUMERATION PLOT No. 104.

ASSOCIATION: Acacia mellifera - Commiphora - Boscia.

POSITION: 5 miles South of Kulbus.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2800'.

RAINFALL: 390 mms.

ASPECT & CONFIGURATION: Exposed. High lying and fairly level.

SOIL: Thin gritty soil of sedentary type, derived from Nubian sandstone rocks. Reddish to light brown in colour.

CANOPY & STOCKING: Local closure in A. mellifera thicket at 10'.

HEIGHT & FORM: Balanites to 20'.
Bush level 12' to 14'.

USE: Nil.

GRASSES & HERBS: Aristida spp. Poor thin cover.
Eragrostis sp.

VEGETATION ENUMERATION PLOT No. 105.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	32	8	4	-	1									45
Combretum cordofanum	6	1	3	1										11
Albizzia sericocephala	4	2	2	1										9
Maerua crassifolia	4	1	3											8
Guiera senegalensis	8													8
Balanites aegyptiaca	1	-	-	1										2
Commiphora africana	-	-	-	1										1
Sclerocarya birrea	-	-	-	-	-	1								1
Stereospermum kunthianum	-	-	-	1										1
Boscia senegalensis	7													7
														93

VEGETATION ENUMERATION PLOT No.105.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 15 miles South of Kulbus.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2800'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Gentle slope to West. (Plot situated on West side of a sand dune).

SOIL: A fairly consolidated sand. Probably first invasion, now more or less compacted. Yellow-red to yellow brown in colour.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Average 18'.

USE: This type of soil is extensively cultivated for Pennisetum spp. grain.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii (abundant
Aristida spp. (frequent)
Eragrostis sp. (occasional)

VEGETATION ENUMERATION PLOT No. 106.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	10	6	3	1	1									21
Acacia tortilis	12	2	4	1										19
Acacia albida *	6	-	1											7
Balanites aegyptiaca	1	3	1	1										6
Combretum cordofanum	4	-	1	-	-	1								6
Acacia seyal	-	2	1											3
Guiera senegalensis	3													3
														65

NOTE:

* Result of grazing animals from nearby cultivations.

VEGETATION ENUMERATION PLOT No. 106.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 33 miles South of Kulbus) (7 miles North of Sileia).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2770'.

RAINFALL: 430 mms.

ASPECT & CONFIGURATION: Fairly level and exposed. Slopes slightly to NW towards a patch of silt.

SOIL: Sand, compacted and with moderately firm surface and structure. Light brown colour. Lower lying pocket of sandy silt to NW. Acacia tortilis and A. seyal occur in predominance in this particular patch.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 20'.
Average 16'.

USE: Similar sand sites nearby are cultivated.

GRASSES & HERBS: Cenchrus spp. (frequent)
Aristida spp. (frequent)
Cymbopogon proximus on silt.

VEGETATION ENUMERATION PLOT No. 107.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	3	MB	24	LB	12								39.
Commiphora africana	7	12	3	2	1	1								26
Acacia tortilis	6	2	3	1										12
Acacia seyal	6	3	-	1										10
Balanites aegyptiaca	-	-	3	1										4
Acacia senegal	4													4
Albizzia sericocephala	-	1	-	2										3
Anogeissus schimperi *	-	-	2											2
Sclerocarya birrea	-	-	-	-	-	1								1
Bauhinia rufescens *	-	-	1											1
														102

NOTE:

* Both species on a small water runnel.

VEGETATION ENUMERATION PLOT No. 107.

ASSOCIATION: Albizzia - Acacia.

POSITION: 7 miles South of Sileia (33 miles North of Geneina).

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2740'.

RAINFALL: 470 mms.

ASPECT & CONFIGURATION: Moderate slope to East. Sheltered to West by hills, lying ½ mile distant.

SOIL: A sandy-silt cum sandy-clay. Derived by water carriage from higher ground to the West. Probably of no great depth as evidenced by occasional local outcrops of basement rock.

CANOPY & STOCKING: Tending towards complete closure. Estimated 0.8 closure over most of the plot.

HEIGHT & FORM: Anogeissus 25'. Other species maximum 18', average 12'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis sp.

VEGETATION ENUMERATION PLOT No. 108.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia albida	14	-	-	-	-	-	-	1	-	-	-	-	3	18
Ziziphus mucronata	8	-	-	-	-	1	-	1	-	-	1			11
Acacia adansonii	-	-	-	3	-	1	1	-	3					8
Balanites aegyptiaca	4	-	-	2	1									7
Albizzia sericocephala	-	2	4	1										7
Bauhinia reticulata	-	1	3	1										5
Acacia tortilis	-	2	-	-	-	1								3
Acacia campylacantha	-	-	-	-	-	2								2
Acacia sieberiana	-	-	-	-	-	-	-	1						1
Grewia tenax	8													8
Cordia ovalis	4													4
Cadaba farinosa	2													2
Cadaba glandulosa	2													2
Dichrostachys glomerata	-	1												1
														79

VEGETATION ENUMERATION PLOT No. 108.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 20 miles south of Sileia. 20 miles north of Geneina. On the west bank flood plain of the Wadi Derram.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2700'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Fairly sheltered by the wadi valley banks - some 30' high.

SOIL: Rich brown sandy silt, with sufficient clay content to cause cracking on drying out.

CANOPY & STOCKING: Closed over large areas. Locally open in small patches.

HEIGHT & FORM: Maximum 45'.

USE: Nil, except grazing.

GRASSES & HERBS: Echinochloa colona.
Tribulus terrestris.

VEGETATION ENUMERATION PLOT No. 109.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	18	MB	13	LB	-								31
Acacia tortilis	6	4	1	-	1									12
Acacia seyal	6	3	2											11
Acacia adansonii	5	3	-	1										9
Albizzia sericocephala	-	3	2											5
Anogeissus schimperi	-	-	2	1	1									4.
Balanites aegyptiaca	1	-	1	1										3
Boscia senegalensis	7	2												9
														84

VEGETATION ENUMERATION PLOT No. 109.

ASSOCIATION: Albizzia - Acacia.

POSITION: 30 miles South of Sileia, 10 miles North of Geneina.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2650'.

RAINFALL: 535 mms.

ASPECT & CONFIGURATION: Open. Gentle slope to South.

SOIL: A compacted sand, with an admixture of silt particles giving cohesion to the body of the soil. Stiff, yet fairly friable. Probably permeable. Light brown in colour.

CANOPY & STOCKING: Locally closed. Well stocked in the younger age classes.

HEIGHT & FORM: Maximum 25'.
Average 12'.

USE: Nil.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii
Aristida adscensionis
Aristida mutabilis (?)
Aristida sp.

VEGETATION ENUMERATION PLOT No. 110.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia adansonii	9	-	-	-	1	1								11
Acacia seyal	3	1	-	2										6
Acacia albida	-	-	1	-	-	-	-	-	-	1	-	-	3	5
Anogeissus schimperi	1	-	3	-	1									5
Ziziphus spina-christi	3	2												5
Bauhinia rufescens	1	3	1											5
Acacia tortilis	-	-	1	-	1	2								4
Balanites aegyptiaca	-	1	-	2										3
Boscia senegalensis	15	3												18
Ziziphus mucronata	-	1	1	-	-	-	-	-	-	-	1	-	-	3
														65

VEGETATION ENUMERATION PLOT No. 110.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 6 miles East of Geneina. Side plain of the Wadi Kaja.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2600'.

RAINFALL: 540 mms.

ASPECT & CONFIGURATION: Open. Silt plain. Level.

SOIL: Rich brown silty clay. Cracks on drying out. Probably deep.

CANOPY & STOCKING: Generally open. Narrow (5 yards) riparian fringe closed at 25' to 30'.

HEIGHT & FORM: Maximum to 30' as above.
Average 18'.

USE: Nil; probably grazed.

GRASSES & HERBS: Sparse, Echinochloa colona.

VEGETATION ENUMERATION PLOT No. 111.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia nilotica * }	345													
Acacia adansonii * }														345
Capparis decidua	2													2
														347

NOTE:-

* It is impossible to distinguish between 4' high A. nilotica and A. adansonii in the leafless state. Both spp. occur as mature trees elsewhere in this area. It is probable that both occur in this plot; A. nilotica on the lower flooded contours and A. adansonii on the higher areas where the flooding is neither so deep nor so prolonged.

Total per acre

1388.

VEGETATION ENUMERATION PLOT No. 111.

ASSOCIATION: Riparian Thornland.

POSITION: 16 miles east of Geneina. Asirni mud flats on the Wadi Kaja.

SIZE: 110 x 11 yds. = $\frac{1}{4}$ acre.

ALTITUDE: 2650'.

RAINFALL: 535 mms.

ASPECT & CONFIGURATION: Partly sheltered by low sand dunes to north and south.

SOIL: Dark brown, almost black, deep cracking clay.

CANOPY & STOCKING: Very dense natural regeneration.

HEIGHT & FORM: Average 4'.

USE: Nil.

GRASSES & HERBS: Nil.

VEGETATION ENUMERATION PLOT No. 112.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	63	18												81
Albizzia sericocephala	3	12	6	1	-	1								23
Ziziphus spina-christs	13													13
Boscia senegalensis	19	4												23
Cassia senna	13													13
Albizzia anthelmintica	1													1
														154

VEGETATION ENUMERATION PLOT No. 112.

ASSOCIATION: Albizzia - Acacia

POSITION: 26 miles East of Geneina, 90 miles West of Kebkabiya.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2700'.

RAINFALL: 530 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating terrain.

SOIL: A sand, probably first sand invasion. Light yellow, free amd largely unconsolidated in the surface layers. Becomes darker yellow brown at 9" and more consolidated in texture.

CANOPY & STOCKING: Open. Stocking of young age classes good.

HEIGHT & FORM: Maximum 14'.
Average 8'.

USE: Similar land nearby used for cultivation. This may be part of a cultivation area abandoned some time ago.

GRASSES & HERBS: Cenchrus spp. (frequent)
Aristida spp. (frequent)
Eragrostis sp. (occasional)
Dinebra retroflexa (occasional)

VEGETATION ENUMERATION PLOT No. 113.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	10	8	1	2										21
Albizzia sericocephala	2	6	7	2	1	1								19
Ziziphus spina-christi	12													12
Bauhinia rufescens	2	4												6
Combretum cordofanum	3	-	-	3										6
Balanites aegyptiaca	-	1	2	1										4
Boscia senegalensis	11	2												13
Grewia tenax	7													7
Cordia crenata	4													4
														92

VEGETATION ENUMERATION PLOT No.113.

ASSOCIATION: Albizzia - Acacia.

POSITION: 36 miles East of Geneina. 80 miles West of Kebkabiya.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'.

RAINFALL: 525 mms.

ASPECT & CONFIGURATION: Exposed. Level plateau.

SOIL: A gritty sandy silt. Mid brown in colour with a few basement complex pebbles occurring in the profile.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 16'.
Average 9'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Aristida plumosa

VEGETATION ENUMERATION PLOT No. 114.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	8	MB	32	LB	-								40
Acacia orfota	SB	15	MB	3	LB	-								18
Acacia senegal	6	2												8
Balanites aegyptiaca	2	4	-	1										7
Acacia seyal	2	1	-	1	1									5
Albizzia sericocephala	-	2	1	2										5
Capparis decidua	-	1	2											3
Acacia tortilis	2													2
														88

VEGETATION ENUMERATION PLOT No. 114.

ASSOCIATION: Albizzia - Acacia.

POSITION: 46 miles East of Geneina. 70 miles West of Kebkabiya.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3500'.

RAINFALL: 520 mms.

ASPECT & CONFIGURATION: Gently undulating plateau, much broken superficially by water runnels and small khors.

SOIL: A basement complex grit. Thin superficial layer of sedentary soil overlying basement complex rocks (mainly granites) at 6" to 9" depth. Deeper pockets of grit also occur.

CANOPY & STOCKING: Open. Locally closed in thorn thicket.

HEIGHT & FORM: Individual trees to 20' (Balanites)
Average bush level 10'.

USE: Nil.

GRASSES & HERBS: Aristida plumosa
Aristida spp.
Cymbopogon proximus

VEGETATION ENUMERATION PLOT No. 115.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Ziziphus mucronata	11	3	1	-	-	-	-	-	-	-	1			16
Acacia albida	3	-	-	-	1	-	-	-	-	-	-	-	3	7
Acacia sieberiana	2	-	-	1	-	1	-	1						5
Albizzia sericocephala	-	2	2	1										5
Anogeissus schimperi	-	-	1	1	-	2								4
Acacia mellifera	-	1	3											4
Acacia campylacantha	-	-	-	-	1									1
Grewia tenax	7													7
Cordia ovalis	3													3
														52

VEGETATION ENUMERATION PLOT No. 115.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 56 miles East of Geneina: 60 miles West of Kebkabiya.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4000'.

RAINFALL: 510 mms.

ASPECT & CONFIGURATION: Level and sheltered.

SOIL: A rich dark brown silt. Very friable and powdery when dry. Does not crack on drying-out.

CANOPY & STOCKING: Closed at 35' to 40' along the riparian strip. Stocking of young growth poor.

HEIGHT & FORM: Maximum of upper storey 45'.
Sporadic secondary storey at 25' to 30'.

USE: Much grazed.

GRASSES & HERBS: Echinochloa colona
Cleome viscosa
Leonitis pallida

VEGETATION ENUMERATION PLOT No. 116.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	23	9												32
Acacia mellifera	SB	8	MB	6	LB	13								27
Acacia seyal	15	3	3											21
Albizzia sericocephala	2	5	4	1										12
Capparis decidua	-	1												1
Cadaba farinosa	8													8
														101

VEGETATION ENUMERATION PLOT No. 116.

ASSOCIATION: Albizzia - Acacia.

POSITION: 66 miles East of Geneina: 5 miles West of Birkat Saira: 50 miles West of Kebkabiya. For continuation of this run to Kebkabiya see plots 40 to 37 inclusive.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4100'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Fairly open and exposed in all directions. Slightly undulating plain going down to a Wadi in the South.

SOIL: Basement complex sedentary grit with patches of water borne silt.

CANOPY & STOCKING: Open. Thorn thicket locally closed or nearly so. Well stocked in young age classes.

HEIGHT & FORM: Average 12'.

USE: Nil.

GRASSES & HERBS: Poor thin Aristida plumosa and Aristida spp.

VEGETATION ENUMERATION PLOT No. 116.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	23	9												32
Acacia mellifera	SB	8	MB	6	LB	13								27
Acacia seyal	15	3	3											21
Albizzia sericocephala	2	5	4	1										12
Capparis decidua	-	1												1
Cadaba farinosa	8													8
														101

VEGETATION ENUMERATION PLOT No. 116.

ASSOCIATION: Albizzia - Acacia.

POSITION: 66 miles East of Geneina: 5 miles West of Birkat Saira: 50 miles West of Kebkabiya. For continuation of this run to Kebkabiya see plots 40 to 37 inclusive.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4100'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Fairly open and exposed in all directions. Slightly undulating plain going down to a Wadi in the South.

SOIL: Basement complex sedentary grit with patches of water borne silt.

CANOPY & STOCKING: Open. Thorn thicket locally closed or nearly so. Well stocked in young age classes.

HEIGHT & FORM: Average 12'.

USE: Nil.

GRASSES & HERBS: Poor thin Aristida plumosa and Aristida spp.

VEGETATION ENUMERATION PLOT No. 117 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	16	4	1											21
Guiera senegalensis	15	2												17
Combretum cordofanum	-	3	2	1										6
Albizzia sericocephala	-	3	1	1										5
Acacia adansonii	2													2
Sclerocarya birrea	1	-	-	-	-	1								2
Bauhinia reticulata	-	-	1											1
Boscia senegalensis	7													7
														61

VEGETATION ENUMERATION PLOT No. 117.

ASSOCIATION: Albizzia - Acacia.

POSITION: 14 miles South of Geneina.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2700'.

RAINFALL: 560 mms.

ASPECT & CONFIGURATION: Fairly exposed. Gently undulating country.

SOIL: A moderately compacted sand. Golden yellow in colour, deep and free draining.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Average 15'.

USE: Similar sites cultivated.

GRASSES & HERBS: Cenchrus biflorus and C. prieurii
Aristida plumosa
Chloris pilosa
Eragrostis tremula (?)

VEGETATION ENUMERATION PLOT No. 118.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	31	5												36
Acacia senegal	20	3	2	4										29
Combretum cordofanum	-	3	8	4										15
Albizzia sericocephala	3	5	2	-	1									11
Boscia senegalensis	11													11
Ziziphus spina-christi	9													9
Bauhinia reticulata	-	1	1											2
Balanites aegyptiaca	-	-	1											1
														114

VEGETATION ENUMERATION PLOT No. 118.

ASSOCIATION: Local sand association in Albizzia-Acacia country.

POSITION: 34 miles South of Geneina: 1 mile South of Misterai.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2750'.

RAINFALL: 575 mms.

ASPECT & CONFIGURATION: Fairly exposed. Gently undulating sand country.

SOIL: A deep loose sand. Yellow in colour, not consolidated. Probably subject to wind erosion if not anchored by vegetation.

CANOPY & STOCKING: Open. Tends towards closure over limited small areas.

HEIGHT & FORM: Average 12'.

USE: Grazing.

GRASSES & HERBS: Cenchrus biflorus
Cenchrus prieurii
Cenchrus ciliaris
Aristida plumosa
(H) Blepharis sp.

VEGETATION ENUMERATION PLOT No. 119 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Commiphora africana	2	5	3	-	1									11
Lannea humilis	-	3	6	2										11
Dalbergia melanoxylon *	7													7
Acacia senegal	4	2												6
Albizzia sericocephala	-	3	1	1										5
Acacia seyal	-	2	2											4
Acacia adansonii	3	-	1											4
Boswellia papyrifera	-	-	1	1	1									3
Balanites aegyptiaca	1	1	-	1										3
Sterculia setigera	-	-	-	-	1	1								2
														56

VEGETATION ENUMERATION PLOT No.119 .

ASSOCIATION: Anogeissus woodland.

POSITION: 52 miles South of Geneina.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2800'.

RAINFALL: 585 mms.

ASPECT & CONFIGURATION: Sheltered to West by a hill sloping gently to East.

SOIL: Sedentary soil derived from a Nubian sandstone inselberg. A red coloured gritty soil. Coarse and free draining.

CANOPY & STOCKING: Open. Stocking poor.

HEIGHT & FORM: Maximum 26'.
Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida plumosa
Aristida sp.
Schmidtia pappophoroides
Eragrostis tremula

VEGETATION ENUMERATION PLOT No. 120.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	5	1	7	2										15
Dalbergia melanoxylon *	5+8													13
Commiphora africana	1	-	4	3	2	2								12
Lannea humilis	-	2	5	4										11
Sclerocarya birrea	-	-	2	-	3	1	-	1	1					8
Combretum cordofanum	-	-	1	2	1									4
Boscia senegalensis	4	4												8
														71

NOTE:

* From two separate rootstocks.

VEGETATION ENUMERATION PLOT No. 120.

ASSOCIATION: Anogeissus woodland.

POSITION: 62 miles South of Geneina.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2900'.

RAINFALL: 595 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level plain.

SOIL: A sandy loam derived from Nubian sandstone materials. Compacted and gritty. Impeded drainage. Soil probably of no great depth. (4').

CANOPY & STOCKING: Open. Stocking moderate, but little representation from younger age classes.

HEIGHT & FORM: Average 18'.

USE: Nil.

GRASSES & HERBS: Burned off.

VEGETATION ENUMERATION PLOT No. 121.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	9	3	5	3										20
Balanites aegyptiaca	4	1	7	1	1									14
Lannea humilis	-	5	7	1										13
Ziziphus spina-christi	6	1												7
Bauhinia reticulata	-	1	3											4
Albizzia sericocephala	-	-	1	2										3
Anogeissus schimperi	-	-	2											2
														63

VEGETATION ENUMERATION PLOT No. 121.

ASSOCIATION: Anogeissus woodland.

POSITION: 3 miles ESE of Beida. 80 miles South of Geneina.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'

RAINFALL: 600 mms.

ASPECT & CONFIGURATION: Level silt plain.

SOIL: A sandy clay. Mid to dark brown in colour. Deep, and apparently fairly free draining. Profile shows a 12" band of water washed stones (2" to 3" diam.) between depths 3' and 4'.

CANOPY & STOCKING: Open. Stocking moderate.

HEIGHT & FORM: Maximum 30'. Average 20'.

USE: Probably grazed.

GRASSES & HERBS: Echinochloa colona
Cymbopogon proximus (local)
Pennisetum sp. (? P. ochrops)

VEGETATION ENUMERATION PLOT No. 122.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Lannea humilis	3	7	6	1										17
Acacia seyal	9	2	1	1										13
Albizzia sericocephala	-	1	3	1	2									7
Combretum cordofanum	-	3	2											5
Dalbergia melanocylon	5													5
Balanites aegyptiaca	-	2	-	1										3
Boscia senegalensis	7													7
Grewia tenax	5													5
Combretum aculeatum	4													4
														66

VEGETATION ENUMERATION PLOT No. 122.

ASSOCIATION: Anogeissus Woodland.

POSITION: 15 miles ESE of Beida; 6 miles West of Arara.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3400'.

RAINFALL: 600 mms.

ASPECT & CONFIGURATION: Fairly high lying exposed plateau. Gently undulating.

SOIL: A sedentary grit soil derived from Basement complex rocks. 5' deep in places, no profile development. Uniformly containing rock fragments from grit up to angular stones 12" and more across.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 18'. Average 15'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Chloris pilosa
Eragrostis tremula

VEGETATION ENUMERATION PLOT No. 123.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Boswellia papyrifera	9	8	13	10	2									42
Lannea humilis	4	3	5	1										13
Acacia seyal	6	3	2											11
Anogeissus schimperi	1	-	3	1										5
Commiphora africana	-	2	1	-	1									4
Albizzia sericocephala	-	4												4
Dalbergia melanoxylon	4													4
Sclerocarya birrea	-	-	-	1	-	1								2
Acacia hebecladoides	-	-	-	1										1
Acacia adansonii	-	-	1											1
														87

VEGETATION ENUMERATION PLOT No. 123.

ASSOCIATION: Anogeissus Woodland.

POSITION: 6 miles East of Arara.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3200'.

RAINFALL: 600 mms.

ASPECT & CONFIGURATION: Undulating hilly terrain.

SOIL: Scree slopes of hill. Largely volcanic material (basaltic lava flow) now disintegrating into blocks and being weathered to soil. This derived brown soil fills the interstices in the rock fragment matrix. Probably a rich but acidic soil.

CANOPY & STOCKING: Actual canopy open, but growth and stocking locally very dense. Elsewhere thin.

HEIGHT & FORM: Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Eragrostis sp.
Chloris plumosa

VEGETATION ENUMERATION PLOT No. 124.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	4	2	9	6										21
Albizzia sericocephala	5	4	7	1	2									19
Dalbergia melanoxylon	12	3												15
Sclerocarya birrea	-	3	-	-	1	2								6
Lannea humilis	1	3	-	-	1									5
Acacia adansonii	4													4
Commiphora africana	-	-	1	2										3
														73

VEGETATION ENUMERATION PLOT No. 124.

ASSOCIATION: Anogeissus Woodland.

POSITION: 20 miles East of Arara: 11 miles West of Habila.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3230'.

RAINFALL: 610 mms.

ASPECT & CONFIGURATION: Exposed plateau. Gently undulating. Surface shows water gullying.

SOIL: A gritty soil of sedentary type, derived from basement complex rocks immediately underlying. No profile development. Compacted and grey-brown in colour. A poor (= forest) soil.

CANOPY & STOCKING: Open. Stocking moderate.

HEIGHT & FORM: Average to 20', exceptionally to 25'.

USE: Nil.

GRASSES & HERBS: Eragrostis tremula and sp.
Aristida spp.

VEGETATION ENUMERATION PLOT No. 125 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Lannea humilis	4	13	8	1	2									28
Albizzia sericocephala	3	9	4	2										18
Acacia seyal	3	3	1	2										9
Anogeissus schimperi	3	1	1	2	-	1								8
Acacia mellifera	SB	4	MB	3	LB	-								7
Dalbergia melanoxylon	4													4
Commiphora africana	-	1	-	1										2
Balanites aegyptiaca	-	-	-	1										1
Boswellia papyrifera	-	1												1
														78

VEGETATION ENUMERATION PLOT No. 125.

ASSOCIATION: Anogeissus Woodland.

POSITION: 4 miles NE of Habila.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2360'.

RAINFALL: 615 mms.

ASPECT & CONFIGURATION: Exposed. Undulating plateau.

SOIL: A poor gritty soil derived from basement complex measures. Sedentary in origin. Reddish-grey in colour. Probably not deep.

CANOPY & STOCKING: Open. Stocking moderate.

HEIGHT & FORM: Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida spp. (abundant)
Eragrostis tremula (frequent)
Andropogon gayanus (occasional)

VEGETATION ENUMERATION PLOT No. 126 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia albida	10	-	-	1	-	-	-	1	-	1	1	-	2	16
Ziziphus mucronata	-	-	-	-	2	-	-	-	-	1	-	-	1	4
Acacia seyal	-	-	-	1	-	1								2
Bauhinia reticulata	-	-	-	1	1									2
Ziziphus mauritiana	-	-	-	-	-	-	-	-	-	-	-	1		1
Cordia abyssinica	-	-	-	-	-	-	1							1
Albizzia sericocephala	-	-	1											1
														27

VEGETATION ENUMERATION PLOT No. 126.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 14 miles East of Habila. On the Wadi Azum, near the Fur village of Baragu.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3280'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Level silt plain. Probably quite exposed as the plain is wide ($1\frac{1}{2}$ miles at least).

SOIL: A sandy alluvium. Rich to deep. Non-cracking. Mid to dark brown in colour. Very friable and powdery when disturbed.

CANOPY & STOCKING: Generally closed. Mainly composed of mature and over-mature trees.

HEIGHT & FORM: Maximum 40'. Average 35'.

USE: Grazing and cultivation.

GRASSES & HERBS: Echinochloa colona
Pennisetum ochrops

VEGETATION ENUMERATION PLOT No. 127.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	13	4	9	2	-	1								29
Lannea humilis	1	7	4											12
Acacia seyal	4	2	-	1										7
Acacia adansonii	1	4	-	-	1									6
Commiphora africana	1	1	2	-	1									5
Acacia hebecladoides	1 (?)	-	1											2
Cadaba farinosa	6													6
Cadaba glandulosa	4													4
Grewia tenax	4													4
Boscia senegalensis	3													3
														78

VEGETATION ENUMERATION PLOT No. 127.

ASSOCIATION: Anogeissus Woodland.

POSITION: 26 miles East of Habila.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Open and exposed. Undulating grit plain.

SOIL: A sedentary gritty soil of basement complex origin. Poorly developed profile. Buff to grey in colour, surface and profile showing many small stones, mainly quartz.

CANOPY & STOCKING: Open, but growth locally dense.

HEIGHT & FORM: Maximum 23'. Average 16'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis spp.
Cymbopogon proximus (locally in clumps)

VEGETATION ENUMERATION PLOT No. 128.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	6	4	4	1	1									16
Acacia adansonii	8	1												9
Albizzia sericocephala	1	2	3	1	1									8
Acacia senegal	7													7
Commiphora africana	2	-	1	2	-	1								6
Balanites aegyptiaca	5	-	-	-	1									6
Lannea humilis	-	2	1	1										4
Grewia tenax	5													5
Cadaba glandulosa	2													2
														63

VEGETATION ENUMERATION PLOT No. 128.

ASSOCIATION: Anogeissus woodland.

POSITION: 40 miles East of Habila; 19 miles West of Kargula.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3310'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Fairly exposed plain. High lying in relation to surrounding terrain.

SOIL: A poor gritty soil of basement complex origin. Sedentary, with no developed profile. Light brown to grey colour, with reddish patches. Granite chippings and quartzes on surface.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 20', exceptionally 25'. Average 16'.

USE: Nil.

GRASSES & HERBS:

Aristida spp.
Aristida plumosa
Schoenfeldia gracilis (rare)
Cymbopogon proximus (local)

VEGETATION ENUMERATION PLOT No. 129.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia albida	-	-	-	-	-	1	-	-	-	1	-	-	2	4
Acacia sieberiana	2	-	-	-	-	-	1							3
Acacia campylacantha	-	-	-	1	-	-	-	-	1					2
Ziziphus mucronata	-	-	-	-	-	-	-	-	1					1
Bauhinia reticulata	-	-	-	-	1									1
Ziziphus spina-christi	10	1	2											13
														24

VEGETATION ENUMERATION PLOT No. 129.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 7 miles West of Kargula. On the Wadi Azum flood plain, North bank.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3320'.

RAINFALL: 625 mms.

ASPECT & CONFIGURATION: Level silt plain.

SOIL: Dark brown silt. Fine texture, locally cracking on surface to a depth of 15". More of a 'clay-silt' than a 'sandy-silt'. Friable and powdery when loosened.

CANOPY & STOCKING: Closed. Locally open in places, caused generally by the death of an over-mature tree.

HEIGHT & FORM: Maximum 45'.
Average 37'.

USE: Grazing and cultivation. This plot has almost certainly been cultivated in the past.

GRASSES & HERBS: Pennisetum ochrops
Echinochloa colona
(H) Cloeme viscosa
(H) Leonitis pallida

VEGETATION ENUMERATION PLOT No. 130 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	3	9	1	2	-	1								16
Anogeissus schimperi	-	2	6	4	1									13
Acacia seyal	2	-	1	3										6
Sclerocarya birrea	-	-	-	-	-	-	1							1
Ziziphus spina-christi	21	4												25
														61

VEGETATION ENUMERATION PLOT No. 130.

ASSOCIATION: Anogeissus Woodland.

POSITION: 9 miles East of Kargula; 11 miles West of Zalingie.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3340'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Sheltered to North. Sloping South to the Wadi Azum plain.

SOIL: A basement complex sedentary grit soil. Light brown to grey in colour. Fairly hard and compacted.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 24'.
Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis sp.
Andropogon gayanus

VEGETATION ENUMERATION PLOT No. 131.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	3	16	25	14										58
Lannea humilis	4	9	12	8										33
Dalbergia melanoxylon	9	4												13
Albizzia sericocephala	-	2	4	1	1									8
Acacia seyal	4	-	1											5
Commiphora africana	1	-	2	-	1									4
Ziziphus spina-christi	3													3
Sclerocarya birrea	-	-	-	-	-	1								1
Balanites aegyptiaca	-	-	1											1
Grewia tenax	6													6
														132

VEGETATION ENUMERATION PLOT No. 131.

ASSOCIATION: Anogeissus Woodland.

POSITION: 8 miles South of Zalingie on the Garsila road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3300'.

RAINFALL: 625 mms.

ASPECT & CONFIGURATION: Open and exposed.

SOIL: A sedentary soil developed from basement complex rocks. Contains a high proportion of fine particles, and is probably of fair depth - certainly over 4' deep. Mid to dark brown in colour with pebbles of quartz scattered throughout the profile.

CANOPY & STOCKING: Closed at 20'.

HEIGHT & FORM: Maximum 26'. Average 18' to 20'.

USE: Probably grazed, otherwise nil.

GRASSES & HERBS: Aristida sp. (frequent).
Aristida plumosa (frequent)
Andropogon gayanus (frequent)

VEGETATION ENUMERATION PLOT NO. 152.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Albizzia sericocephala	4	3	2	4	1	1								15
Acacia mellifera	SB	4	MB	9	LB	2								15
Acacia senegal	9	4	-	1										14
Acacia tortilis	3	2												5
Acacia orfota	SB	2	MB	1	LB	-								3
Adansonia digitata	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Balanites aegyptiaca	-	-	-	1										1
Grewia tenax	7	3												10
Cordia crenata	8													8
Cissus quadrangulus	2													2
														74

VEGETATION ENUMERATION PLOT No. 132.

ASSOCIATION: Albizzia - Acacia.

POSITION: 7 miles WNW of Nyala on the Kas - Zalingie road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2250'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level plateau.

SOIL: Red sand. Coarse and gritty, probably of no great depth, overlying basement complex measures.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Average 12'.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida spp.
Eragrostis sp. Poor grass cover.

VEGETATION ENUMERATION PLOT NO. 133.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	9	MB	23	LB	11								43
Dalbergia melanoxylon	11	9												20
Albizzia sericocephala	7	3	7	1	-	1								19
Acacia tortilis	7	9	3											19
Acacia seyal	4	3	-	1										8
Capparis decidua	3													3
Grewia villosa	8													8
Grewia tenax	3													3
Albizzia anthelmintica	1													1
														124

VEGETATION ENUMERATION PLOT No.133.

ASSOCIATION: Albizzia - Acacia.

POSITION: 17 miles WNW of Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2240'.

RAINFALL: 515 mms.

ASPECT & CONFIGURATION: Exposed. Undulating plateau. Both sheet and gully erosion evident.

SOIL: A poor thin gritty soil derived in situ from basement complex measures lying immediately under. Small stones and gravel (mainly quartz) on surface.

CANOPY & STOCKING: Open. Stocking poor.

HEIGHT & FORM: Maximum 18'. Average 14'.

USE: Nil.

GRASSES & HERBS: Schmidtia pappophoroides

VEGETATION ENUMERATION PLOT No. 134.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia adansonii	-	3	7	14	3									27
Acacia mellifera	SB	7	MB	13	LB	4								24
Acacia seyal	9	4	7											20
Acacia tortilis	12	-	3	1	2									18
Albizzia sericocephala	1	1	5	2										9
Ziziphus spina-christi	8	-	1											9
Balanites aegyptiaca	3	2	-	1										6
Acacia orfota	SB	2	MB	3	LB	-								5
Capparis decidua	3	2												5
Bauhinia rufescens	3	1												4
Acacia senegal	-	1												1
														128

VEGETATION ENUMERATION PLOT No.134.

ASSOCIATION: Albizzia - Acacia.

POSITION: 27 miles WNW of Nyala. South of road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2260'.

RAINFALL: 530 mms.

ASPECT & CONFIGURATION: Gentle slope to North to a large Wadi. Partly sheltered to North by the riparian belt along this Wadi (distant 250 yds.)

SOIL: A dark brown gritty silt. Derived mainly from rain washed particles from the basement complex sedentary soil plain to the South.

CANOPY & STOCKING: Closed in part. Fairly close espacement all over. Stocking good.

HEIGHT & FORM: A. adansonii to 35'. Remainder to 20' maximum and 15' average.

USE: Grazed. Could be cultivated but would not be a very good soil for this purpose.

GRASSES & HERBS: Echinochloa colona
Cloeme viscosa

VEGETATION ENUMERATION PLOT No. 135 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	13	MB	19	LB	3								35
Albizzia sericocephala	3	11	9	8	1	2								34
Acacia seyal	9	9	6	-	1									25
Acacia senegal	6	16	1	2										25
Acacia tortilis	3	2	3	-	1									9
Acacia orfota	SB	-	MB	8	LB	-								8
Capparis decidua	-	4												4
Ziziphus spina-christi	3													3
Capparis tomentosa	9													9
														152

VEGETATION ENUMERATION PLOT No.135.

ASSOCIATION: Albizzia - Acacia.

POSITION: 37 miles WNW of Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2280'.

RAINFALL: 545 mms.

ASPECT & CONFIGURATION: Exposed open plateau. Surface much broken up by water runnels.

SOIL: Basement complex sedentary grit soil. Reddish brown to buff colour. Shallow and stony.

CANOPY & STOCKING: Locally closed. Stocking good.

HEIGHT & FORM: Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.

VEGETATION ENUMERATION PLOT NO. 136.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	7	4	9	6	-	1								27
Ziziphus spina-christi	17	4												21
Acacia seyal	8	8	3	-	1									20
Albizzia sericocephala	6	2	7	1										16
Hyphaene thebaica *	12													12
Acacia orfota	SB	2	MB	7	LB	-								9
Bauhinia rufescens	3	5												8
Acacia senegal	7													7
Acacia tortilis	-	-	4	1										5
Ziziphus mucronata	3	-	-	1										4
Bauhinia reticulata	-	-	2	1										3
														132

NOTE:

* Clumps. Each one from a separate root-stock.

VEGETATION ENUMERATION PLOT No. 136

ASSOCIATION: Albizzia - Acacia

POSITION: 47 miles WNW of Nyala. 8 miles East of Kas.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2290'.

RAINFALL: 560 mms.

ASPECT & CONFIGURATION: Level and exposed. The Eastern extremity of the Kas plain.

SOIL: A water borne silt, rich mid-brown in colour. Partially contaminated in the surface 4" by water borne grits of local origin. The main soil is a volcanic loam deposited by water action on what was presumably once the terminal delta of the Kas wadi system, whose origin is in the Marra massif foothills.

CANOPY & STOCKING: Typically open.

HEIGHT & FORM: 20'.

USE: Used for cultivation.

GRASSES & HERBS: Echinochloa colona

VEGETATION ENUMERATION PLOT NO. 137.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	11	7	3	1										22
Acacia seyal	14	2	1	-	1									18
Acacia tortilis	10	7	-	-	1									18
Albizzia sericocephala	4	6	3	1	2									16
Dalbergia melanoxylon	9	2	2											13
Balanites aegyptiaca	2	2	6	1	1									12
Grewia villosa	13													13
Cadaba farinosa	8													8
Cadaba glandulosa	1													1
														121

VEGETATION ENUMERATION PLOT No. 137.

ASSOCIATION: Albizzia - Acacia.

POSITION: 57 miles WNW of Nyala, 2 miles WNW of Kas.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3000'.

RAINFALL: 585 mms.

ASPECT & CONFIGURATION: Fairly high, more or less level, plateau.

SOIL: A sandy grit of basement complex origin. In places up to 3' deep, elsewhere the basement rocks outcrop on the surface. (Granites and schists).

Buff in colour. A poor soil.

CANOPY & STOCKING: Locally more or less closed in patches. Stocking good.

HEIGHT & FORM: Average 13'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.
Eragrostis sp.

VEGETATION ENUMERATION PLOT NO. 138.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	13	7	6	2	-	1								29
Ziziphus spina-christi	20	7	2											29
Acacia seyal	8	6	5	1	2									22
Acacia senegal	3	1	2											6
Grewia villosa	8													8
Cissus quadrangulus	2													2
														96

VEGETATION ENUMERATION PLOT No. 138.

ASSOCIATION: Albizzia - Acacia.

POSITION: 12 miles WNW of Kas.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3040'.

RAINFALL: 640 mms.

ASPECT & CONFIGURATION: Fairly exposed. Level.

SOIL: Another example of the great Kas volcanic loam plain. Similar in detail to plot 136.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Balanites to 24'. Bush level 10' to 12'.

USE: Abandoned cultivation site.

GRASSES & HERBS: Aristida spp.
Chloris spp.

VEGETATION ENUMERATION PLOT NO. 139.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Boswellia papyrifera	2	12	10	2										26
Anogeissus schimperi	-	8	7											15
Lannea humilis	-	4	5	3										12
Commiphora africana	3	1	4	-	1									9
Dalbergia melanoxylon	5													5
Albizzia sericocephala	-	1	1											2
Sclerocarya birrea	-	-	-	-	1									1
Balanites aegyptiaca	-	-	1											1
Grewia tenax	11													11
Combretum aculeatum	4													4
														86

VEGETATION ENUMERATION PLOT No. 139.

ASSOCIATION: Anogeissus Woodland.

POSITION: 22 miles WNW of Kas.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3200'.

RAINFALL: 690 mms.

ASPECT & CONFIGURATION: Exposed. Crest of a ridge.

SOIL: Matrix of basement complex boulders with pockets of grit and soil. An extremely poor quartzose grit soil.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 24'; Average 18' to 20'.

USE: Nil.

GRASSES & HERBS: Cymbopogon proximus (frequent clumps)
Aristida spp.
Eragrostis sp. (rare)

VEGETATION ENUMERATION TEST No. 140.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia albida	-	-	-	-	-	-	1	-	-	-	-	1	2	4
Albizzia sericocephala	-	1	2	1										4
Bauhinia reticulata	-	2	1	1										4
Cordia abyssinica	-	-	1	-	1									2
Ficus sycamorus	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Acacia sieberiana	-	-	-	-	-	-	-	1						1
Thespesia garkiana	27													27
Ziziphus spina-christi	13													13
Cordia ovalis	10													10
Grewia tenax	8													8
Cadaba glandulosa	7													7
														81

VEGETATION ENUMERATION PLOT No. 140.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 33 miles WNW of Kas.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3500'.

RAINFALL: 695 mms.

ASPECT & CONFIGURATION: Sheltered. A fairly narrow riparian strip, sheltered by side banks.

SOIL: Rich brown sandy loam (alluvium). Deep. Porous and friable.

CANOPY & STOCKING: Open. Stocking poor.

HEIGHT & FORM: To 45'.

USE: Grazed. Would be cultivated if more land available.

GRASSES & HERBS: Echinochloa colona
Tribulis terrestris
(H) Cleome viscosa
(H) Leonitis pallida

VEGETATION ENUMERATION PLOT No. 141.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	35	9	1	3										48
Acacia seyal	3	8	5	1										17
Balanites aegyptiaca	4	3	7	2										16
Ziziphus spina-christi	7	2	4											13
Albizzia sericocephala	2	2	5	-	1									10
Combretum elliotii	-	-	-	1										1
Grewia tenax	5													5
														110

VEGETATION ENUMERATION PLOT No. 141.

ASSOCIATION: Anogeissus Woodland.

POSITION: 42 miles WNW of Kas. 24 miles from Zalingie.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3450'.

RAINFALL: 680 mms.

ASPECT & CONFIGURATION: Fairly sheltered, level, and low-lying.

SOIL: Brown to mid-brown loam, probably of alluvial origin, with a superficial admixture of basement complex grits in the top 6" of soil.

CANOPY & STOCKING: Very nearly closed (0.8 to 0.9 closure).

HEIGHT & FORM: Average 25'.

USE: Grazed (probably).

GRASSES & HERBS: Aristida spp.
Chloris pilosa
Eragrostis major (?)
Andropogon gayanus

VEGETATION ENUMERATION PLOT No. 142.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	-	2	4	2										8
Balanites aegyptiaca	1	-	-	2	1	-	1							5
Acacia sieberiana	-	1	-	-	1	1	-	-	-	1				4
Acacia albida	-	-	-	-	-	-	-	1	-	-	1	-	1	3
Albizzia sericocephala	-	-	-	1	-	1								2
Acacia hebecladoides	-	-	-	-	2									2
Combretum cordofanum	-	-	-	1										1
Thespesia gaskiana	15													15
Ziziphus spina-christi	8	2	2											12
														52

VEGETATION ENUMERATION PLOT No. 142.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 52 miles WNW of Kas. 14 miles from Zalingie.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3400'.

RAINFALL: 650 mms.

ASPECT & CONFIGURATION: Sheltered. Level valley floor.

SOIL: Dark brown sandy loam (alluvium) - water-borne volcanic material. A rich soil, deep and fairly porous. Becomes saturated during the rainy season and forms a surface skin of clay particles (at most $\frac{1}{4}$ to $\frac{1}{2}$ inch thick) which cracks and curls back on drying out.

CANOPY & STOCKING: Locally closed in patches.
Stocking deficient in younger age classes.

HEIGHT & FORM: Maximum 40' (A. sieberiana)
Average much lower - 25' to 30'.

USE: Grazed. If nearer habitation would almost certainly be cultivated.

GRASSES & HERBS: Echinochloa colona
(H) Cleome viscosa
(H) Leonitis pallida

VEGETATION ENUMERATION PLOT No. 143.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	17													17
Anogeissus schimperi	1	1	7	4										13
Balanites aegyptiaca	5	1	-	1										7
Albizzia sericocephala	-	4	2											6
Lannea humilis	-	3	3											6
Commiphora africana	2	-	-	3										5
Acacia tortilis	5													5
Sclerocarya birrea	-	-	-	-	1									1
Ziziphus spina-christi	21	2												23
														83

VEGETATION ENUMERATION PLOT No. 143.

ASSOCIATION: Anogeissus Woodland.

POSITION: 62 miles WNW of Kas. 4 miles from Zalingie

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3360'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Plateau. Open and exposed.

SOIL: Mainly a sedentary grit of basement complex origin, with small patches of water transported loam. Reddish-buff colour with many pebbles and small stones on the surface.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 25'. Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Cymbopogon proximus
Chloris spp.

VEGETATION ENUMERATION PLOT No. 144.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Ziziphus spina-christi	22	2	1	2										27
Acacia seyal	2	4	-	2	2	1								11
Balanites aegyptiaca	2	1	-	1	-	1	1	-	-	-	-	1		7
Acacia albida	2	1	-	-	-	-	-	-	-	-	-	-	3	6
Ziziphus mucronata	-	2	-	-	1	-	-	1	-	1				5
Thespesia garkiana	1	3												4
Acacia sieberiana	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Ziziphus mauritiana	-	-	-	1										1
														62

VEGETATION ENUMERATION PLOT No. 144.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 10 miles East of Zalingie on the Kebe road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3350'.

RAINFALL: 620 mms.

ASPECT & CONFIGURATION: Level and sheltered.

SOIL: A mid to dark brown sandy silt with a good proportion of clay. Is fairly loose and friable, probably adequate but not free draining. Does not crack on drying out.

CANOPY & STOCKING: Generally open at 35'.

HEIGHT & FORM: Various individual trees and species run from 30' to 45'.

USE: Grazed. Similar land cultivated for Sorghum sp. millets.

GRASSES & HERBS: Echinochloa colona
Andropogon gayanus
(H) Leonitis pallida

VEGETATION ENUMERATION PLOT No.145 .

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	24	14	2	3										43
Acacia senegal	23	11												34
Anogeissus schimperi	-	3	18	5										26
Balanites aegyptiaca	3	-	1	-	2									6
Albizzia sericocephala	2	1	3											6
Acacia hebecladoides	-	-	2	1										3
														118

VEGETATION ENUMERATION PLOT No. 145.

ASSOCIATION: Anogeissus Woodland.

POSITION: 20 miles East of Zalingie on the Kebe road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4300'.

RAINFALL: 760 mms.

ASPECT & CONFIGURATION: Exposed. Fairly high lying undulating plain.

SOIL: A sedentary gritty soil derived from underlying basement complex rocks. Light to mid brown colour, compacted, poor development.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 25'. Average 18'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Eragrostis tremula
Cymbopogon proximus

VEGETATION ENUMERATION PLOT No. 146.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	7	16	12	1										36
Acacia seyal	14	8	12											34
Ziziphus spina-christi	8	4	1											13
Commiphora africana	4	-	3											7
Albizzia sericocephala	-	3	2											5
Acacia senegal	3													3
Acacia tortilis	3													3
Acacia hebecladoides	-	-	1	-	1									2
Lannea humilis	-	-	-	1										1
Thespesia garkiana	34	6												40
														144

VEGETATION ENUMERATION PLOT No. 146.

ASSOCIATION: Anogeissus Woodland.

POSITION: 35 miles West of Zalingie. 8 miles West of Kebe.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4325'.

RAINFALL: 740 mms.

ASPECT & CONFIGURATION: Exposed. Fairly high-lying area. Gentle slope to north.

SOIL: A volcanic loam. Rich brown in colour, loose and friable in texture. Free draining. Volcanic rocks present in numbers both on soil surface and in profile.

CANOPY & STOCKING: Fairly open. Say 0.5 closure.

HEIGHT & FORM: Maximum 30'. Average 18'.

USE: Nil, except grazing.

GRASSES & HERBS: Andropogon gayanus
Aristida spp.

VEGETATION ENUMERATION PLOT No. 147.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	37	103	19	4										163
Boswellia papyrifera	10	3	-	-	-	1								14
Combretum elliotii	4	7	3											14
Acacia seyal	3	8	-	-	1									12
Albizzia sericocephala	-	-	7	-	2									9
Lannea humilis	-	-	-	1										1
Dichrostachys glomerata	49													49
														262
														(= 524 per acre)

VEGETATION ENUMERATION PLOT No.147.

ASSOCIATION: Anogeissus woodland.

POSITION: 2 miles North of Kebe on Guldu road. (In Kebe Central Forest Reserve).

SIZE: 220 x 11 yds. = ½ acre.

ALTITUDE: 4350'.

RAINFALL: 700 mms.

ASPECT & CONFIGURATION: South side of Jebel Fadili. Sheltered by hill to North. Sloping South.

SOIL: A basement complex grit. Matrix of red and white granite stones and gravel with a light brown gritty loam infill.

CANOPY & STOCKING: Average 0.8 closure. Stocking very good.

HEIGHT & FORM: Maximum 28'. Average 18'.

USE: Nil. (A central forest reserve, in which area all rights are extinguished).

GRASSES & HERBS: Poor thin Andropogon gayanus and Aristida sp.

VEGETATION ENUMERATION PLOT No. 148.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	26	18	9	1	2	-	1							57
Acacia seyal	42	3	9	1										55
Lannea humilis	13	16	5	1										35
Albizzia sericocephala	4	4	-	2	1									11
Commiphora africana	1	4	2											7
Acacia senegal	4													4
Cordia abyssinica	-	-	-	-	-	1								1
														170

VEGETATION ENUMERATION PLOT No. 148.

ASSOCIATION: Anogeissus Woodland.

POSITION: 5 miles West of Guldu.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4300'.

RAINFALL: 630 mms.

ASPECT & CONFIGURATION: Exposed. Level open plain.

SOIL: A rich brown alluvium. Deep and friable. Has a certain amount of grit in the profile. Probably of fair depth - not less than 8'.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 30'. Average 18'.

USE: Nil.

GRASSES & HERBS: Andropogon gayanus
Hyparrhenia pseudocymbaria
(H) Leonitis pallida

VEGETATION ENUMERATION PLOT No. 149.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Lannea humilis	34	21	8	8	2									73
Acacia seyal	41	13	2	6										62
Anogeissus schimperi	4	9	3	2	-	3								21
Albizzia sericocephala	7	5	-	1										13
Acacia senegal	13													13
Commiphora africana	-	-	2	-	-	1								3
Combretum cordofanum	-	2	1											3
Acacia hebecladoides	-	-	-	1										1
														189

VEGETATION ENUMERATION PLOT No. 149.

ASSOCIATION: Anogeissus Woodland.

POSITION: 21 miles NW of Guldu.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4300'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Exposed, high-lying gently undulating plateau. Surface cut up by water runnels.

SOIL: A basement complex grit. A compacted poorly developed soil. Buff in colour, gritty in texture, with many stones on surface. Approximately 3' to 4' deep.

CANOPY & STOCKING: Open, but stocking good.

HEIGHT & FORM: Maximum 24'. Average 16'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Chloris sp.

VEGETATION ENUMERATION PLOT No. 150.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	17	MB	25	LB	1								43
Commiphora africana	7	8	3	1	2									21
Balanites aegyptiaca	3	5	4											12
Acacia senegal	6													6
Albizzia sericocephala	-	1	2											3
Acacia seyal	1	1	1											3
Sclerocarya birrea	-	-	-	-	-	1								1
														89

VEGETATION ENUMERATION PLOT No. 150.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles South of Kebkabiya on the Zalingie road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4500'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Exposed. High-lying plateau.

SOIL: Sedentary soil derived from basement complex series. Buff colour, gritty texture, and poor profile development. Both sheet and gully erosion evident on the area.

CANOPY & STOCKING: Thicket formation.

HEIGHT & FORM: Average 12'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Eragrostis sp.
Chloris plumosa

VEGETATION ENUMERATION PLOT No. 151.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	31													31
Acacia albida	19	2	3	-	-	1								25
Ziziphus mucronata	2	14	-	-	1									17
Acacia tortilis	17													17
Balanites aegyptiaca	8	4	2	1	-	1								16
Acacia seyal	6	4	2	1										13
Ziziphus spina-christi	13													13
														132
														(= 264 per acre)

VEGETATION ENUMERATION PLOT No.151.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 20 miles South of Kebkabiya on the Zalingie road.

SIZE: 110 x 22 yds. = ½ acre.

ALTITUDE: 4300'.

RAINFALL: 480 mms.

ASPECT & CONFIGURATION: Fairly exposed. Sloping North to the South bank of the Wadi Barei. Northern exposure.

SOIL: A light to mid brown silt. Partly of alluvial origin from the Wadi, and partly rain washed grits from the basement complex sedentary grit soil plains to the South.

CANOPY & STOCKING: Thicket closure. Stocking very dense.

HEIGHT & FORM: Maximum 30'. Average 16'.

USE: Nil.

GRASSES & HERBS: Echinochloa colona

(H) Leonitis pallida (rare, local)

VEGETATION ENUMERATION PLOT NO. 152.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Anogeissus schimperi	3	15	22	7	2									49
Lannea humilis	12	11	3	5	-	1								32
Acacia seyal	4	2	1											7
Acacia senegal	6	1												7
Ziziphus mucronata	7													7
Balanites aegyptiaca	-	1	1	1	2									5
Acacia adansonii	3	-	-	-	-	1								4
Albizzia sericocephala	-	-	1											1
Dichrostachys glomerata	10													10
														122

VEGETATION ENUMERATION PLOT No. 152.

ASSOCIATION: Anogeissus Woodland.

POSITION: 36 miles South of Kebkabiya on the Zalingie road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4000'.

RAINFALL: 530 mms.

ASPECT & CONFIGURATION: Level and exposed plateau.

SOIL: Basement complex sedentary grit soil. Buff to reddish in colour, coarse texture, poor development. Subject to both sheet and gully erosion.

CANOPY & STOCKING: Thicket closure. Stocking good.

HEIGHT & FORM: Maximum 20'. Average 12' to 15'.

USE: Nil.

GRASSES & HERBS: All burned off.
Probably Aristida sp. et al

VEGETATION ENUMERATION TEST No 138.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia seyal	10	6	2											18
Anogeissus schimperi	-	3	6	2	1									12
Acacia orfota	SB	3	MB	5	LB	-								8
Balanites aegyptiaca	-	1	3	1	1									6
Acacia senegal	4	2												6
Albizzia sericocephala	2	-	1	-	1									4
Acacia adansonii	2	-	-	1										3
Acacia hebecladoides	-	-	1											1
Grewia tenax	10													10
														68

VEGETATION ENUMERATION PLOT No. 153.

ASSOCIATION: Anogeissus Woodland.

POSITION: 52 miles South of Kebkabiya on the Zalingie road. 19 miles North of Zalingie.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3700'.

RAINFALL: 580 mms.

ASPECT & CONFIGURATION: Level high ground. Exposed.

SOIL: Basement complex sedentary grit soil. Compacted with poor development. Light brown colour with reddish discolouration in places. Much loose stones and gravel on the surface and in profile. Over 3' deep.

CANOPY & STOCKING: Generally open. Local thicket closure.

HEIGHT & FORM: Maximum 24' (Balanites). Average 17'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.

VEGETATION ENUMERATION PLOT No. 131.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Ziziphus mucronata	31	4	2											37
Acacia seyal	8	2	-	5	1									16
Balanites aegyptiaca	3	2	4	1	2	1								13
Acacia albida	-	-	-	1	-	1	-	-	-	1				3
														69

VEGETATION ENUMERATION PLOT No. 154.

ASSOCIATION: Modified (Riparian) Thorn Forest.

POSITION: 62 miles South of Kebkabiya, near Jebel Bash.
9 miles North of Zalingie.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3350'.

RAINFALL: 610 mms.

ASPECT & CONFIGURATION: High lying plain. Fully exposed.

SOIL: A sandy clay, probably sedentary origin. Basement complex rocks outcrop nearby, and surface of soil in plot has scattered stones of basement origin.

Originally probably a depression in the basement complex which has become filled in with rain washed grits and silt. Compacted structure.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Maximum 35'. Average 20' to 25'.

USE: Grazed.

GRASSES & HERBS: Nil. All grazed off.
Probably Aristida spp. mainly.
Some Cymbopogon proximus in one local patch (not grazed).

VEGETATION ENUMERATION PLOT No. 155.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Combretum sp.	2	5	3											10
Terminalia macroptera	-	-	1	4	1									6
Anogeissus schimperi	-	2	1											3
Ziziphus mucronata	-	-	1											1
Thespesia garkiana	34	8												42
														62

VEGETATION ENUMERATION PLOT No.155 .

ASSOCIATION: Anogeissus Woodland (badly degraded).

POSITION: 5 miles South of Nyertetie on the Kas road. South end of Murtagello forest reserve.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 4200'.

RAINFALL: 740 mms.

ASPECT & CONFIGURATION: Fairly high-lying plateau in foothills country. Exposed.

SOIL: A rich brown loam of volcanic origin, i.e., water sorted and transported material from the break down of volcanic rocks in the central massif and foothills. Boulders of lava and pumice found in surface and in profile.

CANOPY & STOCKING: Very open. Really grassland with scattered trees. Stocking extremely poor.

HEIGHT & FORM: Maximum 25'. Average 16'.

USE: Grazed. Probably cultivated up to 40 or 50 years ago.

GRASSES & HERBS: Hyparrhenia pseudocymbaria
Andropogon gayanus

VEGETATION ENUMERATION PLOT No. 156.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	-	7	5	1	3	1								17
Lannea humilis	-	6	8	-	1									15
Acacia seyal	8	3	1	2										14
Combretum sp.	2	4	3											9
Boswellia papyrifera	-	-	-	6	1									7
Balanites aegyptiaca	6	-	-	1										7
Anogeissus schimperi	-	1	3	2										6
Sterculia setigera	-	-	-	-	1									1
														76

VEGETATION ENUMERATION PLOT No.156 .

ASSOCIATION: Anogeissus Woodland.

POSITION: 12 miles from Nyertetei on the Kas road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3800'.

RAINFALL: 710 mms.

ASPECT & CONFIGURATION: Exposed. Sloping hill-collar of detritus.

SOIL: A young soil. Grit derived from the break-down of a volcanic intrusion through basement complex series. Is composed of both volcanic and basement particles.

CANOPY & STOCKING: Closed in local thickets. Stocking numerically poorer than would appear to the eye.

HEIGHT & FORM: Maximum 24'.
Average 18'.

USE: Nil.

GRASSES & HERBS: Andropogon gayanus
Aristida spp.

VEGETATION ENUMERATION PLOT NO. 137.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Balanites aegyptiaca	9	3	4	1	3	-	1							21
Acacia seyal	7	-	1	1										9
Acacia albida	-	-	3	-	-	1	-	-	-	-	1			5
Albizzia sericocephala	-	-	2											2
Cordia abyssinica	-	-	-	-	-	-	-	1						1
														38

VEGETATION ENUMERATION PLOT No. 157.

ASSOCIATION: Anogeissus Woodland.

POSITION: 22 miles from Nyertetei on the Kas road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3200'.

RAINFALL: 660 mms.

ASPECT & CONFIGURATION: Level plain. Fairly exposed.

SOIL: A water-borne brown silt of volcanic origin. Fairly high proportion of sand and grit particles. Deep and well drained, does not show surface cracking.

CANOPY & STOCKING: Very open.

HEIGHT & FORM: Maximum 35'.

USE: Probably grazed.

GRASSES & HERBS: Echinochloa colona.

VEGETATION ENUMERATION PLOT NO. 138.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Guiera senegalensis	20													20
Ziziphus spina-christi	6													6
Acacia senegal	1													1
														27

NOTE:
The first two species above are confined to mounds of harder 'sn' type soil.

VEGETATION ENUMERATION PLOT No. 158.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 10 miles SSW of Fasher on the Melemm road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3250'.

RAINFALL: 310 mms.

ASPECT & CONFIGURATION: Exposed sand dune.

SOIL: Reddish yellow free sand. Deep and permeable. Small areas of more consolidated sand - more into a sandy silt - the 'sn' sites referred to opposite.

CANOPY & STOCKING: Very open. Actually derived grassland with very scattered clumps of bushes.

HEIGHT & FORM: Maximum 9'. Average 7'.

USE: Cultivation. This is cultivation regrowth.

GRASSES & HERBS: Aristida pallida and sp. (frequent)
Eragrostis tremula (abundant)

VEGETATION ENUMERATION TEST NO. 139.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	8	1												9
Ziziphus spina-christi	8													8
Boscia senegalensis	3	2												5
Albizzia sericocephala	4													4
Commiphora africana	-	-	-	1										1
Balanites aegyptiaca	-	-	1											1
														28

VEGETATION ENUMERATION PLOT No. 159.

ASSOCIATION: Thorn Savanna on Sand.

POSITION: 20 miles SSW of Fasher on the Melemm road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3300'.

RAINFALL: 320 mms.

ASPECT & CONFIGURATION: Slightly sheltered to East by crest of dune. Otherwise open and exposed.

SOIL: A golden-yellow to red-yellow sand. Surface loose to a depth of 6" to 9", thereafter slightly consolidated.

CANOPY & STOCKING: Very open. More into grassland with occasional trees and bushes.

HEIGHT & FORM: Maximum 22' (Balanites)

USE: Probably old cultivation site. Certainly grazed.

GRASSES & HERBS: Aristida spp. (abundant)
Cenchrus biflorus (frequent)
Eragrostis tremula (occasional, locally frequent)

VEGETATION ENUMERATION PLOT No. 160.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24 +	TOTAL
Acacia orfota	SB	21	MB	11	LB	-								32
Acacia mellifera	SB	9	MB	8	LB	2								19
Boscia senegalensis	9	7												16
Capparis decidua	2	4	1											7
Acacia tortilis	-	-	-	1										1
														75

VEGETATION ENUMERATION PLOT No. 160.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 30 miles SSW of Fasher on the Melemm road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3350'.

RAINFALL: 330 mms.

ASPECT & CONFIGURATION: Exposed, open plain.

SOIL: A gritty sandy-silt soil. Mid-brown to gray-brown, compacted, impeded drainage.

CANOPY & STOCKING: Generally open. Local thicket closure over small areas. Stocking poor.

HEIGHT & FORM: Average tree height - 16'.
Average bush height - 8' (one large A. mellifera to 16').

USE: Nil.

GRASSES & HERBS: Aristida sp. (poor growth)
Cymbopogon proximus (local)

VEGETATION ENUMERATION PLOT No. 161.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	14	MB	16	LB	4								34
Acacia tortilis	9	6	6	3	1									25
Balanites aegyptiaca	2	-	-	1										3
Commiphora africana	-	1	-	-	1									2
Albizzia sericocephala	-	-	1											1
Boscia senegalensis	-	1												1
Grewia tenax	10													10
Grewia villosa	9													9
Cadaba glandulosa	6													6
														91

VEGETATION ENUMERATION PLOT No. 161.

ASSOCIATION: Acacia mellifera- Commiphora - A. tortilis - A. orfota.

POSITION: 40 miles SSW of Fasher on the Melemm road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3400'.

RAINFALL: 345 mms.

ASPECT & CONFIGURATION: Exposed. Undulating plateau. Water eroded surface.

SOIL: A sedentary grit soil of basement complex origin. Reddish colour, much gravel (typically quartz) on surface.

A pure "forest" soil.

CANOPY & STOCKING: Generally open, but growth locally dense.

HEIGHT & FORM: Maximum 21'.
Average 10'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.
Schoenfeldia gracilis
Cymbopogon proximus (local)

VEGETATION ENUMERATION PLOT No. 162.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	9	MB	14	LB	10								33
Commiphora africana	7	5	6	1	4	1								24
Acacia senegal	5	1	1											7
Boscia senegalensis	2	3												5
Capparis decidua	-	1	1	1										3
Acacia tortilis	2	2												4
Sclerocarya birrea	-	-	-	-	1									1
Maerua crassifolia	-	-	-	1										1
Albizzia sericocephala	-	-	1											1
Acacia orfota	SB	-	MB	1	LB	-								1
														80

VEGETATION ENUMERATION PLOT No.162.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 50 miles SSW of Fasher, 20 miles North of Melemm.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3500'.

RAINFALL: 375 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating plateau.

SOIL: A gritty soil of obvious basement complex derivation. Probably not developed in situ, but deposited by water action in the (geological) past. Slight profile development consistent with water deposition in different periods.

CANOPY & STOCKING: Fairly open on the whole. Dense in small patches of a few square yards.

HEIGHT & FORM: Average 12'.

USE: Nil.

GRASSES & HERBS: Cymbopogon proximus

VEGETATION ENUMERATION PLOT NO 203.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Ziziphus spina-christi	16	4	-	1										21
Acacia albida	7	-	-	-	-	-	-	-	-	-	1	2	1	11
Acacia tortilis	-	1	4	3										8
Bauhinia rufescens	1	3	2	1										7
Bauhinia reticulata	4	-	-	-	1									5
Acacia adansonii	1	1	-	-	1									3
Balanites aegyptiaca	-	2	-	-	1									3
Ziziphus mucronata	-	-	-	-	-	1	-	-	-	-	1			2
Acacia seyal	-	1	-	-	1									2
Albizzia sericocephala	-	-	1	1										2
Gymnosporia senegalensis	-	-	1	1										2
Dichrostachys glomerata	5													5
Combretum aculeatum	4													4
Grewia tenax	3													3
Cissus quadrangulus	1													1
														79

VEGETATION ENUMERATION PLOT No.163.

ASSOCIATION: Riparian Thorn Forest.

POSITION: 60 miles SSW of Fasher. 10 miles North of Melemm.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3400'.

RAINFALL: 400 mms.

ASPECT & CONFIGURATION: Fairly sheltered. On one of the numerous wadis near Melemm.

SOIL: A brown alluvium of volcanic origin. A rich and deep soil. Somewhat coarse and gritty in some horizons - particularly that from 12" to 20" deep. Apparently free drainage, although from its site it must be saturated during a large part of the rains.

CANOPY & STOCKING: Open generally.

HEIGHT & FORM: 35' to 40'.

USE: Grazed.

GRASSES & HERBS: Pennisetum ochrops
Echinochloa colona

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	9	MB	36	LB	12								57
Commiphora africana	3	2	4	1	2									12
Acacia senegal	8	3												11
Acacia orfota	SB	4	MB	-	LB	-								4
Acacia tortilis	2	-	1											3
Capparis decidua	-	1	1											2
Grewia tenax	10	5												15
														104

VEGETATION ENUMERATION PLOT No. 164.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles SW of Melemm on the Kidingir-Nyala road. 3 miles South of Keila wells.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3450'.

RAINFALL: 485 mms.

ASPECT & CONFIGURATION: Fairly level plain.

SOIL: A sedentary soil of basement complex origin. Brown-grey in colour, gritty in texture, and with quartz and granite gravel on surface.

CANOPY & STOCKING: Thicket closure at 9' over most of the plot. Stocking fairly dense.

HEIGHT & FORM: Trees to 17'. Average bush height 9'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Schmidtia pappophoroides
Sparse cover.

VEGETATION ENUMERATION PLOT No. 165.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	15	MB	13	LB	2								30
Albizzia sericocephala	5	9	3	1	1									19
Commiphora africana	1	3	5	4	2									15
Acacia senegal	7	-	1											8
Acacia tortilis	3	3	1											7
Acacia seyal	-	-	1	-	1									2
Balanites aegyptiaca	-	-	-	1										1
														82

VEGETATION ENUMERATION PLOT No. 165.

ASSOCIATION: Albizzia - Acacia.

POSITION: 20 miles from Melemm. 54 miles NNE of Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3500'.

RAINFALL: 505 mms.

ASPECT & CONFIGURATION: Level and exposed.

SOIL: A sedentary grit soil of basement complex origin. Poor, compacted and gravelly. Subject to surface erosion by water.

CANOPY & STOCKING: Open. Stocking relatively poor.

HEIGHT & FORM: Maximum 21'. Average 10'.

USE: Nil.

GRASSES & HERBS: Aristida sp.
Schmidtia pappophoroides
Dinebra retroflexa

VEGETATION ENUMERATION PLOT No. 166.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	17	3	1	2										23
Acacia mellifera	SB	7	MB	8	LB	3								18
Albizzia sericocephala	7	4	2	-	1									14
Ziziphus spina-christi	5	1												6
Acacia orfota	SB	5	MB	1	LB	-								6
Balanites aegyptiaca	3	-	1	1										5
Sclerocarya birrea	-	-	1											1
Grewia tenax	8													8
Boscia senegalensis	2													2
														83

VEGETATION ENUMERATION PLOT No. 166.

ASSOCIATION: Albizzia - Acacia

POSITION: 30 miles from Melemm, 44 miles from Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 3100'.

RAINFALL: 515 mms.

ASPECT & CONFIGURATION: Exposed. Gently undulating plateau.

SOIL: A gritty, stony sedentary soil derived from basement complex rocks. Light-brown to grey in colour. No profile development. Quartz and granite chippings on surface and in profile. Impeded drainage.

CANOPY & STOCKING: Open. Stocking fairly good, particularly in younger age classes.

HEIGHT & FORM: Maximum 18'. Average 12'.

USE: Nil.

GRASSES & HERBS: Poor, thin, Aristida spp.

VEGETATION ENUMERATION PLOT No. 167.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	31	8	1	1										41
Acacia orfota	SB	12	MB	13	LB	-								25
Acacia mellifera	SB	3	MB	6	LB	-								9
Acacia seyal	6	1	1											8
Albizzia sericocephala	1	3	1	2										7
Dalbergia melanoxylon	6													6
Balanites aegyptiaca	-	-	1	-	1	1								3
Capparis decidua	-	1	-	1										2
Grewia tenax	7	1												8
Combretum aculeatum	4													4
														113

VEGETATION ENUMERATION PLOT No. 167.

ASSOCIATION: Albizzia - Acacia.

POSITION: 40 miles from Melemm, 34 from Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2800'.

RAINFALL: 515 mms.

ASPECT & CONFIGURATION: Exposed. Fairly level plain.

SOIL: A sandy-silt soil. Derived after prolonged weathering and water-sorting from surrounding basement complex country rock. Impeded drainage. Colour mid-brown to buff to grey. Texture coarse. Few pebbles in profile.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 22'. Average 13'.

USE: Nil, except grazing.

GRASSES & HERBS: Aristida spp.
Chloris sp.

VEGETATION ENUMERATION PLOT No. 168.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia orfota	SB	36	MB	17	LB	-								53
Acacia mellifera	SB	14	MB	23	LB	1								38
Acacia senegal	22													22
Balanites aegyptiaca	15	1	-	2	1									19
Albizzia sericocephala	7	5	1	1	1									15
Ziziphus spina-christi	14													14
Acacia seyal	5	3	2											10
Hyphaene thebaica *	2													2
Adansonia digitata	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Grewia tenax	9													9
														183

NOTE:-

* Two clumps each from a separate rootstock.

VEGETATION ENUMERATION PLOT No.168 .

ASSOCIATION: Albizzia - Acacia.

POSITION: 50 miles from Melemm, 24 from Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2500'.

RAINFALL: 510 mms.

ASPECT & CONFIGURATION: Fairly exposed plain.

SOIL: A mid brown sandy gritty silt, probably water-borne over a short distance. Of basement complex origin.

CANOPY & STOCKING: Generally open. Local thicket closure over small areas. Stocking fairly dense.

HEIGHT & FORM: Maximum 20'. Average 13'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Schmidtia pappophoroides

VEGETATION ENUMERATION PLOT NO. 169.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia senegal	32	12	3											47
Acacia orfota	SB	12	MB	6	LB	-								18
Albizzia sericocephala	-	7	4	2										13
Acacia tortilis	6	1	-	1										8
Acacia mellifera	SB	3	MB	3	LB	-								6
Acacia seyal	-	2	1	-	1									4
Grewia tenax	11													11
Grewia villosa	8													8
														115

VEGETATION ENUMERATION PLOT No. 169.

ASSOCIATION: Albizzia - Acacia.

POSITION: 60 miles from Melemm; 14 from Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2350'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Fairly level and fully exposed.

SOIL: A shallow drift sand (probably varying in depth from 2' to 10') overlying basement complex rocks or basement complex derived grits. Sand free and fairly loose. Free drainage.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 18'. Average 10'.

USE: Nil, except possibly grazing.

GRASSES & HERBS: Aristida spp.
Schmidtia pappophoroides
Eragrostis tremula
Cenchrus biflorus (rare)

VEGETATION ENUMERATION PLOT NO. 170.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Commiphora africana	-	13	5	2	1	1								22
Albizzia sericocephala	5	9	4	1	2									21
Acacia mellifera	SB	3	MB	9	LB	6								18
Dalbergia melanoxylon	14													14
Acacia tortilis	8	2	-	1										11
Acacia orfota	SB	-	MB	3	LB	-								3
Grewia tenax	23													23
Combretum aculeatum	9													9
														121

VEGETATION ENUMERATION PLOT No.170.

ASSOCIATION: Albizzia - Acacia.

POSITION: 70 miles from Melemm; 4 miles from Nyala.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2220'.

RAINFALL: 500 mms.

ASPECT & CONFIGURATION: Gentle slope to South and SW - i.e., exposed to the main rain direction. Sheltered to the North, or main dry wind direction.

SOIL: A compacted sedentary grit soil derived from basement complex measures. Reddish brown in colour, probably of no great depth. Usual stones and gravel on surface.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 18'. Average 10'.

USE: Nil.

GRASSES & HERBS: Thin poor covering of *Aristida* spp.

VEGETATION ENUMERATION PLOT No. 171.

ENUMERATION SHEET.

Two Inch Diameter Classes.

SPECIES.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24+	TOTAL
Acacia mellifera	SB	6	MB	15	LB	1								22
Acacia senegal	14													14
Commiphora africana	3	2	1	1	1									8
Acacia tortilis	2	-	1	-	1									4
Albizzia sericocephala	-	1	2											3
Acacia orfota	SB	3	MB	-	LB	-								3
Capparis decidua	1													1
Ziziphus spina-christi	5	2												7
Cordia crenata	4	2	1											7
Albizzia anthelmintica	1	1												2
Grewia tenax	2													2
														73

VEGETATION ENUMERATION PLOT No. 171.

ASSOCIATION: Acacia mellifera - Commiphora - A. tortilis - A. orfota.

POSITION: 10 miles South of Melemm on the Minawashie road.

SIZE: 220 x 22 yds. = 1 acre.

ALTITUDE: 2290'.

RAINFALL: 435 mms.

ASPECT & CONFIGURATION: Fairly level and exposed plateau.

SOIL: A sedentary grit soil derived from basement complex parent material. No profile development. Impeded drainage.

CANOPY & STOCKING: Open.

HEIGHT & FORM: Maximum 24'. Average 13'.

USE: Nil.

GRASSES & HERBS: Aristida spp.
Chloris sp.
Eragrostis sp.